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The millipede genus *Glomeris* Latreille, 1802 (Diplopoda, Glomerida, Glomeridae) in North Africa

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Abstract

In North Africa, the genus *Glomeris* is shown to encompass 11 species, all of which are keyed. These include: *G. troglokabyliana* **sp. n.** from several caves in Algeria, *G. monostriata* **sp. n.** from a cave in Libya, *G. colorata* **sp. n.**, an epigean species from Tunisia, *G. anisosticta* Brandt, 1841 (still a *nomen inquirendum*) from Algeria, *G. brolemanni* Schubart, 1960 from Morocco, *G. carthaginiensis* Schubart, 1953 (**stat. n.**, elevated from subspecific rank) from Tunisia, *G. flavomaculata* Lucas, 1846 from Algeria, *G. klugii* Brandt, 1833 (with *G. marmorata* Brandt, 1833, *G. fuscomarmorata* Lucas, 1846, and *G. maculosa* Verhoeff, 1921 as new junior subjective synonyms) from Algeria and Tunisia, *G. mohamedanica* Attems, 1900 from Tuni-

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sia, *G. punica* Attems, 1900 (with *G. numidia* Verhoeff, 1921 as a new junior subjective synonym) from Tunisia, and *G. sublimbata* Lucas, 1846 from Algeria and Tunisia.

Keywords
Diplopoda, Glomerida, *Glomeris*, taxonomy, new species

Introduction

The millipede order Glomerida is basically a temperate to warm temperate Holarctic group which contains about 30 genera and some 450 species (Mauriès 2006). Only six genera and about 80 species occur in the Oriental or Neotropical realms, reaching Sulawesi and Guatemala in the South, respectively. The genus *Glomeris* Latreille, 1802, with the type-species *G. pustulata* (Fabricius, 1781), is the largest, numbering about 100 species and a few hundred subspecies, varieties, forms or aberrations, largely from Europe, but marginally also in the Canaries, North Africa and northwestern Anatolia. Like all Glomerida, in Africa *Glomeris* species only occur north of the Sahara, along a relatively narrow strip of the Mediterranean coast, in rather humid habitats. This genus is characterized by a subquadrate shape of the telopod femur, which is not markedly hypertrophied in relation to the adjacent podomeres and is supplied with a broad distocaudal lobe instead of a distinct process (Mauriès 2006).

The taxonomy of *Glomeris* has only recently been improved. In particular, the Central European and Macaronesian faunas were reviewed and keyed (Hoess 2000; Golovatch and Enghoff 2003), with the main species-specific characters currently recognized as lying in colour patterns and, to a lesser extent, telopod structure. The identities of several Central European congeners were clarified with the use of allozyme electrophoresis (Hoess and Scholl 1999; Hoess 2000), whereas scanning electron microscopy was quite extensively applied to the study of the *alluaudi*-group of *Glomeris* endemic to the Canary Islands (Golovatch and Enghoff 2003).

The first *Glomeris* ever to have been recorded in Africa seems to be *G. klugii* Brandt, 1833, a species originally described from a single female from "Egypt or Syria" (Brandt 1833), but later rectified as coming from "Syria" (Brandt 1840b). The holotype, still housed in the Berlin Museum (Moritz and Fischer 1973), was found to have been mislabeled, and *G. klugii* proved to be a senior synonym of the common European species *G. undulata* C. L. Koch, 1844 (Golovatch 2003).

Glomeris, as well as a few other myriapod genera, was then simply listed as present in Algeria (Brandt 1840a). A few months later, two much more detailed accounts appeared. The first of these, Brandt's (1840b) review of *Glomeris*, mentioned two forms of *G. pustulata* found in Algeria and Germany, which were described or referred to as "var. *microstemma* n." and "var. *marmorata*" Brandt, 1833, respectively. Brandt also stated that both these varieties were very common in Algeria, but occurred much less frequently in Germany. The second publication (Brandt 1841a) was an essay specifically focusing on the fauna of Algeria. It largely repeated the same information, but the same varieties

were instead referred to as *G. pustulata* "var. *anisosticta* n." and "var. *marmorata*"! Just like *microstemma*, the variety *anisosticta* was stated to differ from the European samples of *G. pustulata* in showing both median spots on the thoracic shield smaller than the lateral ones. Unfortunately, this information was omitted from both the Brandt bibliography and the list of Brandt's diplopod taxa in Golovatch and Hoffman (2001), otherwise this confusion would have already been corrected. It is now apparent that these names are strictly synonymous, with *microstemma* Brandt, 1840 having priority over *anisosticta* Brandt, 1841 and representing the first truly African glomeridan to have been named. In contrast, *marmorata* was downgraded from a full species (Brandt 1833) to a variety of *G. pustulata*, while the samples from Algeria were found to be typical var. *marmorata* (Brandt 1840b, 1841a, b), in no way differing from their European counterparts.

At the present, the type material of *microstemma* and *anisosticta* seems to be lost, since it is missing from the collections of the Berlin (Moritz and Fischer 1973, 1978) and St. Petersburg (Golovatch and Hoffman 2001) museums. A neotype designation would therefore be necessary to revive either name as a taxon. Verhoeff (1906) was apparently the last author to use the name *microstemma*, still as a variety (this time of *G. pustulata norica* Latzel, 1884), and even incorporated it into a key. In contrast, because *anisosticta* has since been elevated to the rank of a full species (Brolemann 1921), despite having been published slightly later, we use *anisosticta* as the valid name.

Although the identity of *G. marmorata* might appear to lie beyond the scope of the present study, because it was first described from Hercynia (= Harz), Germany (Brandt 1833), it will be resolved below due to its relevance to the North African fauna. This taxon has hitherto remained dubious (Golovatch and Hoffman 2001), even though the type material has long been available in the Berlin Museum (Moritz and Fischer 1978). It is highly regrettable that Hoess (2000) did not attempt to revise type material of numerous Central European *Glomeris* when preparing his otherwise very useful review and key. Otherwise he could not have overlooked the great similarity between *G. marmorata*, as redescribed and beautifully illustrated by Koch (1863) from samples taken in southern Germany (and probably also based in part on a restudy of type material), and *G. undulata* which Hoess also very skillfully depicted himself.

Shortly after Brandt's contributions appeared, Lucas (1846) described three new species of *Glomeris* from Algeria: *G. sublimbata* Lucas, 1846, *G. fuscomarmorata* Lucas, 1846 and *G. flavomaculata* Lucas, 1846, all listed, redescribed and nicely illustrated after in his atlas (Lucas 1849). Among these species, only *G. flavomaculata* was found to be abundant, being represented by five varieties. Since these received no names (they were simply denominated A to E), they have no nomenclatural status. Because type material of all three species is still available in the Paris Museum, they could be revised and, when necessary, lectotypes selected (see below). Brölemann (1913a) provided a brief redescription of *G. sublimbata*, based on new samples from Algeria.

Pocock (1892) referred some fresh specimens from Algeria to *G. fuscomarmorata* and *G. flavomaculata*, but emphasized that probably both were at most only varieties of the European *G. conspersa* C. L. Koch, 1844 and *G. connexa* C. L. Koch, 1844, respectively. In contrast, Silvestri (1896) identified new material from Tunisia as *G. sublimbata*

and *G. flavomaculata*, already formally treating both as just varieties of *G. connexa*. Thereafter, Attems (1900), violating all rules of priority, described a new subspecies, *Glomeris europaea striata* n., within which he distinguished several varieties, including the var. *pustulata* (Fabricius, 1781), var. *transalpina* C. L. Koch, 1836 etc., as well as the newly described var. *punica* n. and var. *mohamedanica* n., both from Tunisia. Soon after that, Attems (1908) transferred his var. *punica* to *G. connexa* and added *G. conspersa* C. L. Koch, 1844, forma *genuina* (= *conspersa*) to the Tunisian list. Both of the originally infrasubspecific names by Attems, however, have since become validated as species-group taxa. Thus, in his list of North African millipedes, Brolemann (1921) reported three species of *Glomeris* from Algeria: *G. anisosticta* Brandt, 1841, *G. fuscomarmorata* Lucas, 1846 and *G. pustulata* Latreille, 1804 (sic!); one from Tunisia: *G. connexa punica* Attems, 1900; and another three from both these countries: *G. conspersa* C. Koch, 1847 (= *marmorata*), *G. flavomaculata* Lucas, 1846 and *G. sublimbata* Lucas, 1846. He must have either forgotten to include *G. mohamedanica* or considered it as a variety not worth mentioning. Schubart (1953), when revising Brolemann's (1921) checklist, treated both *G. mohamedanica* Attems, 1900 and *G. punica* Attems, 1900 as full species.

Verhoeff (1921) described a further two species from Algeria: *G. maculosa* Verhoeff, 1921 and *G. numidia* Verhoeff, 1921. Brolemann (1925) added to the confusion by describing from Tunisia the new subspecies *G. pustulata trisulcata* n., a long pre-occupied name (*G. intermedia trisulcata* Rothenbühler, 1899). To eliminate this homonymy, Schubart (1953) renamed it as *G. pustulata carthaginiensis* Schubart, 1953. He also described the first congener from Morocco: *G. brolemanni* Schubart, 1960, and provided some useful comments on the *Glomeris* fauna of North Africa in relation to a new record of *G. flavomaculata* in Algeria (Schubart 1960, 1963). Finally, Abrous-Kherbouche and Mauriès (1996) reported two *Glomeris* species from a nature reserve in Algeria, and provided an updated checklist of the Diplopoda of that country.

Superficially, all *Glomeris* species, including those from North Africa, can more or less easily be separated into two groups, formerly invalidly treated as subgenera. One group, *Eurypleuromeris* Verhoeff, 1906, includes the species with a laterally broadened tergum 3 (tergum 4 as counted by Verhoeff (1906, 1921), who considered the thoracic shield to be composed of two terga, 2nd and 3rd). The other, *Stenopleuromeris* Verhoeff, 1909, includes the species with a laterally narrowed tergum 3, in particular its anterior (condylar) part shortened in relation to its posterior part, the two parts being separated by a stria. This distinction may still be useful, but it was only after Jeekel's (1971) typification that both these names could be correctly applied. Despite this, all of the numerous nominate subgenera or synonyms of *Glomeris* (see Mauriès 2006) remain hopelessly heterogeneous. Thus, *Glomeris conspersa* C. L. Koch, 1847 (= *G. klugii* Brandt, 1833) became the type-species of *Eurypleuromeris* and, like *Glomeris connexa* C. L. Koch, 1847, the type-species of *Euglomeris* Verhoeff, 1906, shows a broadened condylar part of tergum 3. The type-species of *Stenopleuromeris* was designated as *Glomeris pulchra* C. L. Koch, 1847 which, like *G. pustulata*, the type-species of *Glomeris* s. str., or *G. dorsosanguine* Verhoeff, 1906, the type-species of *Xestoglomeris* Verhoeff, 1906, has a shortened anterior part of tergum 3. So at the present, follow-

ing Hoess (2000), it seems best not to use a formal subgeneric division of *Glomeris*, referring instead to informal groups in quotation marks. In addition, this character/distinction appears to be subject to a degree of variation (see below).

Taking into account the two other glomeridans described from North Africa—*Eupeyerimhoffia algerina* Brölemann, 1913 from Algeria (Brölemann 1913b) and *Glomerellina convolvens africana* Ceuca, 1988 from Tunisia (Ceuca 1988)—all previous knowledge of the regional fauna of Glomerida can be summarized in the following checklist (Table 1). *G. conspersa*, reported from Tunisia and Algeria (Attems 1908; Abrous-Kherbouche and Mauriès 1996), is listed under the name *G. klugii* because it is just a colour morph of the latter (Hoess 2000; Golovatch 2003).

Rich material, including type material of Brandt, Lucas, Attems, Verhoeff and Brolemann, has been amassed from various sources for the present review. The following acronyms are adopted here for the relevant repositories:

FMNH Field Museum of Natural History, Chicago, U.S.A.
HNHM Hungarian Natural History Museum, Budapest, Hungary
MNHN Muséum national d'Histoire naturelle, Paris, France
MSNF Museo di Storia naturale, "La Specola", Florence, Italy
NHMW Naturhistorisches Museum Wien, Austria
NMNH National Museum of Natural History, Sofia, Bulgaria
ZMUB Museum für Naturkunde, Humboldt Universität, Berlin, Germany
ZMUC Natural History Museum of Denmark (Zoological Museum), University of Copenhagen, Denmark
ZMUM Zoological Museum, State University of Moscow, Russia
ZSM Zoologische Staatssammlung, Munich, Germany

Table 1. A checklist of the Glomerida in North Africa, based on literature records (A: Algeria, M: Morocco, T: Tunisia).

Species	A	T	M
Eupeyerimhoffia algerina Brölemann, 1913	+		
Glomerellina convolvens africana Ceuca, 1988		+	
Glomeris anisosticta Brandt, 1841	+		
G. brolemanni Schubart, 1960			+
G. flavomaculata Lucas, 1846	+	+	
G. fuscomarmorata Lucas, 1846	+		
G. klugii Brandt, 1833 (= *G. conspersa* C. L. Koch, 1844)	+	+	
G. maculosa Verhoeff, 1921	+		
G. numidia Verhoeff, 1921	+		
G. mohamedanica Attems, 1900		+	
G. punica Attems, 1900		+	
G. pustulata carthaginiensis Schubart, 1953		+	
G. sublimbata Lucas, 1846	+	+	

In the catalogue sections, D stands for the original description, R for a redescription or descriptive notes, F for new faunistic records, N for a new name, and L for simple listings.

Systematics

***Glomeris troglokabyliana* Golovatch & Mauriès, sp. n.**
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Fig. 1

Type material. Algeria, Algiers, "dept. Alger", Michelet-Djurdjura road, Azerou Tidjer, entrance of Ifri Mareb Cave, 19.XI.1912, leg. P. de Peyerimhoff (Biospeologica 704A), holotype ♂ (MNHN CC 165), paratypes: 2 ♂, 3 ♀, 8 juv. (MNHN CC 165). Same locality, Azerou Tidjer, Ifri bou-Amane Cave, 19.XI.1912, leg. P. de Peyerimhoff (Biospeologica 706), paratypes: 1 ♂, 2 ♀ (ZMUM). Same locality, 29.VII.1913, leg. P. de Peyerimhoff (Biospeologica 707), paratypes: 6 ♂, juv. ♂, 23 ♀, juv. ♀ (MNHN CC 165), 1 ♂, 1 ♀ (ZMUC), 3 ♀ (NMNH), 3 ♀ (FMNH), 3 ♀ (NHMW 7779). Same locality, Michelet-Djurdjura road, douar Aït-Boudrar, Anou Tahalouant Cave, 11.VII.1914, leg. P. de Peyerimhoff (Biospeologica 710), 1 ♂ (MNHN CC 165). Algeria, "dept. Alger", Bouïra, douar Haïzer, Ifri Yacoub Cave, 30.X.1912, leg. P. de Peyerimhoff (Biospeologica 915), paratypes: 3 ♂, 5 ♀, 7 juv. (MNHN CC 165). Algeria, "dept. Alger", douar Ben-bou-Ouakour, canton Beni Mansour Maillot, n'Tarzout Cave, 8.III.1914, leg. P. de Peyerimhoff (Biospeologica 906), 1 ♀ (MNHN CC 165).

Name: To emphasize the provenance of material from caves in the High Kabylia, Algeria.

Diagnosis: Differs from all congeners except *G. albida* Mauriès & Vicente, 1978 and *G. monostriata* sp. n. in the clear troglomorphy (in particular, the lack of pigmentation), coupled with two striae crossing the collum and 1-2 striae crossing the thoracic shield, and usually with (6)7+1 ocelli.

Description: Length of extended adults of both sexes ranging between 13.5-14.0 (♂) and 15.0-17.5 mm (♀), width 3.4-4.2 (♂) and 5.0-5.8 mm (♀), body broadest at thoracic shield. Holotype ca 13.5 mm long and 3.65 mm wide (extended), or ca 9.5 and 3.5 mm, respectively (unextended). Juveniles with 12 segments (like adults) and 5 ocelli, ca 4.8 mm long and 2.2 mm wide. Juveniles with 11 segments and 5 ocelli, ca 4.5 mm long and 2.2 mm wide. Juveniles with 10 segments and 3 ocelli, ca 3.4 mm long and 1.75 mm wide. Juveniles with 8 or 9 segments and 2-3 ocelli, ca 2.7-2.8 mm long and 1.13-1.40 mm wide.

Coloration entirely pallid.

Head usual, transverse; Tömösváry's organ transversely oval, strongly elongate (Fig. 1A); antennae long, antennomere 6 longest, 2.5-2.8 times longer than wide (Fig. 1B); ocelli usually 7+1, rather convex but usually transparent and thus poorly visible (Fig. 1A), only rarely pigmented (5+1 or 6+1 grey ocelli in ♂♂ from Anou Tahalouant and n'Tarzout caves, respectively).

Collum with two transverse striae.

Thoracic shield with a narrow hyposchism reaching the caudal tergal contour (Fig. 1C); 3-4 transverse striae, of which 1-2 anterior, starting well in front of schism, crossing entire dorsum, while the others, starting just above schism, are abbreviated (Fig. 1C).

Tergal surface very finely punctate. Terga 3 and 4 rather broadly rounded laterally, tergum 3 being only slightly narrower (Fig. 1C). Tergal pilosity and mid-dorsal sinuosity lacking. Pygidium usually with a completely regularly rounded caudal margin, only rarely extremely faintly sinuated medially at margin.

♂ leg 17 (Fig. 1D) with a medium-sized, regularly rounded, outer coxal lobe; telopodite 4-segmented.

♂ leg 18 (Fig. 1E) with a broadly ogival syncoxital notch; telopodite 4-segmented.

Telopods (Figs 1F, G) with a rather high, regularly rounded, bare, central syncoxital lobe flanked by two setose horns, each crowned with a very small bulb and a long, setiform filament. Femur with a large caudomedial outgrowth, subquadrate at base. Tibia with a caudomedial unciform process. Tarsus rather broadly rounded apically.

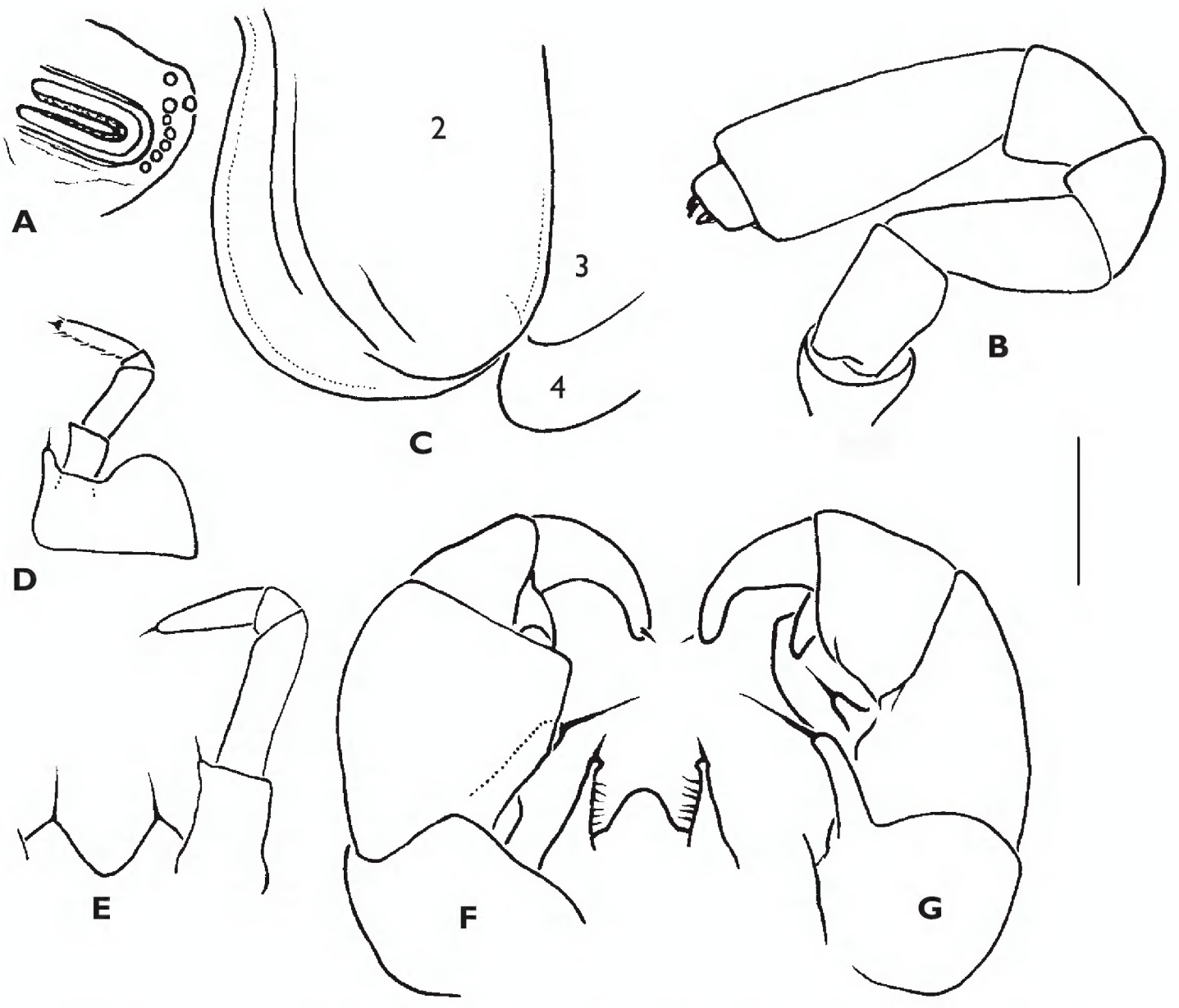

Figure 1. *Glomeris troglokabyliana* sp. n., ♂ paratype; **A**, left part of head showing ocelli and Tömösváry's organ, dorsal view; **B**, antenna, lateral view; **C**, thoracic shield and terga 3 & 4, lateral view; **D**, leg 17; **E**, leg 18; **F, G**, leg 19 (telopod), caudal and frontal views, respectively. – Scale bar: 0.3 mm (D-G); drawn not to scale (A-C).

Remarks: This species is the only clearly troglomorphic congener to be reported from Algeria. It is noteworthy that some specimens show rudimentary pigmentation of the ocelli.

Based on the shape of tergum 3, this new species can be regarded as somewhat intermediate between the "*Stenopleuromeris*" and "*Eurypleuromeris*" types, although closer to the former.

Glomeris monostriata Golovatch & Mauriès, sp. n.

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Fig. 2

Type material. Libya, Cyrenaica, Ayn Dabusia, cave near Al Qubbah, 280 m, 32°50'00.9"N, 22°16'49.6"E (WGS84), 8.IV.2008, leg. S. Taiti, holotype ♂ (MNHN CC 166), paratypes: 1 ♂, 2 ♀ (MNHN CC 166), 1 ♂, 1 ♀ (MSNF), 1 ♂, 1 ♀ (ZMUM).

Name: To emphasize the collum and the thoracic shield each being crossed by only a single stria.

Diagnosis: Differs from all congeners except *G. albida* Mauriès & Vicente, 1978 in being troglomorphic, coupled with only a single stria crossing the collum and thoracic shield; differs from *G. albida* in the evidently bifid horns and a lower central lobe of the telopod syncoxite.

Description: Length of adults of both sexes (unextended, alcohol material) ranging between 8.0 and 9.0 mm, width between 3.0 and 3.2 mm, up to ca 11 and 3.5 mm, respectively (extended animals); body broadest at thoracic shield. Holotype (unextended) ca 8.2 mm long and 3.2 mm wide. Coloration entirely pallid.

Head usual, transverse; Tömösváry's organ transversely oval, slightly less extended transversely than in *G. troglokabyliana* sp. n.; antennae long, antennomere 6 longest, 2.4-2.5 times longer than wide; distance between antennal sockets 1.95 times greater than socket diameter; ocelli 4+1, rather convex, but transparent and thus poorly visible.

Collum with one (anterior) transverse stria.

Thoracic shield with a narrow hyposchism reaching the caudal tergal contour (Fig. 2A); two transverse striae, of which the one starting well in front of the schism crosses the entire dorsum, the other, starting just above the schism, is abbreviated (Fig. 2A).

Tergum 3 relatively narrowly (Fig. 2A) and tergum 4 broadly rounded laterally. Tergal pilosity and mid-dorsal sinuosity missing. Pygidium usually with a completely regularly rounded caudal margin, only rarely extremely faintly sinuated medially at margin.

♂ leg 17 (Fig. 2B) with a low, slightly irregularly rounded, outer coxal lobe; telopodite 4-segmented.

♂ leg 18 (Fig. 2C) with an ogival syncoxital notch; telopodite 4-segmented.

Telopods (Figs 2D, E) with a low, regularly rounded, bare, central syncoxital lobe flanked by two setose and evidently bifid horns. Prefemur micropapillate distolaterally. Femur with a large caudomedial outgrowth, subquadrate at base. Tibia with a tuber-

culiform caudomedial outgrowth and a strong caudolateral seta near base. Tarsus quite narrowly rounded apically.

Remarks: This species is the first glomeridan to be recorded in Libya and, given that it is troglobitic, may represent a relictual element.

In general, the condition of having just one stria, rather than two, crossing the collum is extremely rare in *Glomeris* species. The only other congener showing this condition that we are aware of is *G. albida* Mauriès & Vicente, 1978, a troglobite from Málaga, Spain (Mauriès and Vicente, 1978). Both these species are evidently regressive, apparently in response to cavernicoly. Similarly, *G. albida* also demonstrates two striae on the thoracic shield, only the anteriormost of which crosses the dorsum. In addition, both these species are pallid, of about the same size, with the same number (5) of ocelli and the same proportions (L/D 2.5) of antennomere 6, and both are devoid of tergal or pygidial sinuosity. The main differences concern the shape of the telopod

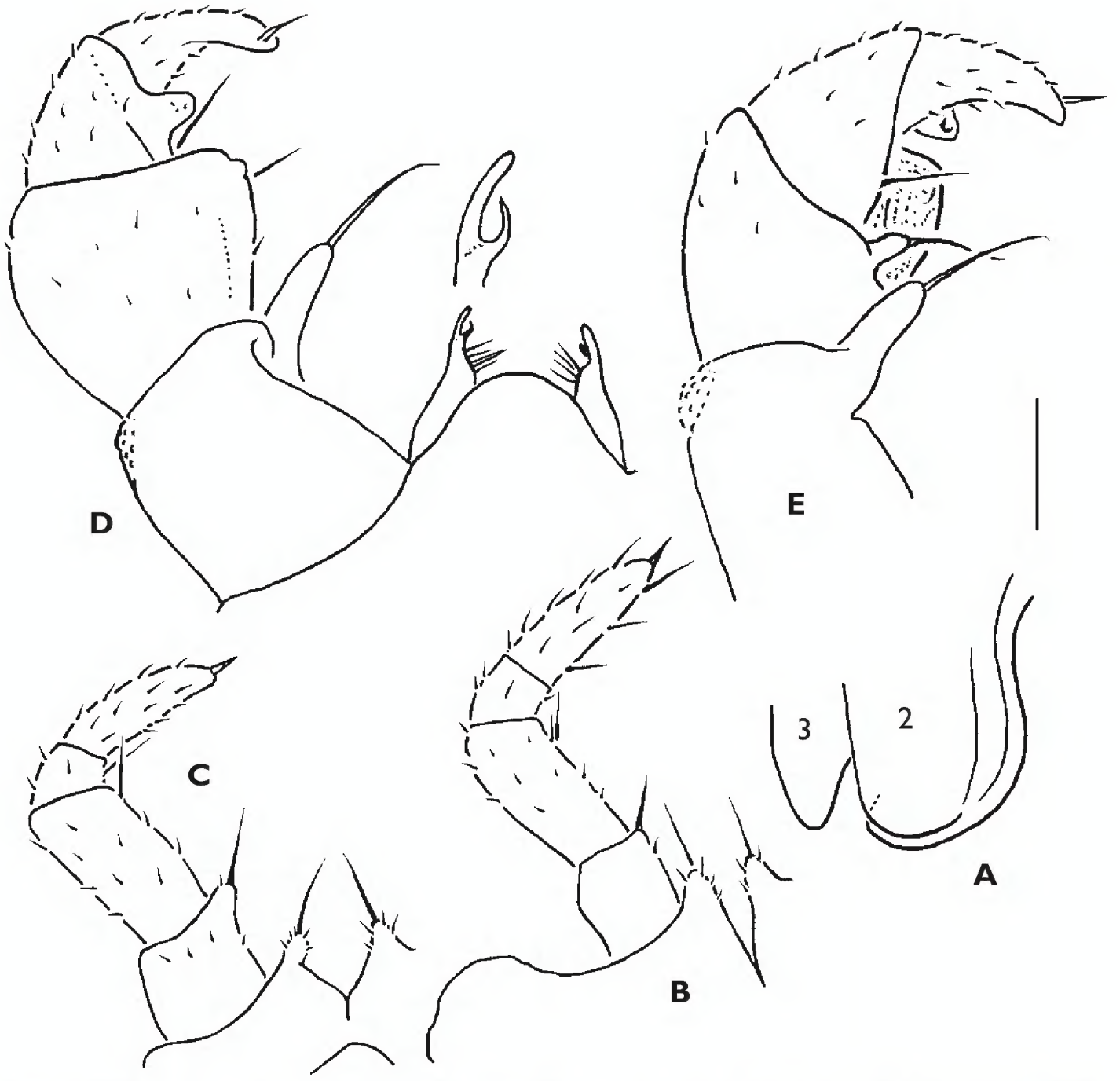

Figure 2. *Glomeris monostriata* sp. n., ♂ paratype; **A**, thoracic shield and tergum 3, lateral view; **B**, leg 17; **C**, leg 18; **D, E**, leg 19 (telopod), caudal and frontal views, respectively. – Scale bar: 0.2 mm (B-E); drawn not to scale (A).

syncoxite, being strongly marked in the bifid tip of the horns and the relatively low and regularly rounded central lobe in *G. monostriata* sp. n.

Even more regressive appears to be *G. dionysii* (Strasser, 1961), a troglobite from Sicily, Italy, which totally lacks striae on the collum (Strasser 1961).

Based on the narrow tergum 3, *G. monostriata* sp. n. can readily be attributed to the "*Stenopleuromeris*" type.

Glomeris colorata Golovatch, Mauriès, Akkari & Stoev, sp. n.

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Figs 3-5

Type material. Tunisia, Siliana Gov., Jebel Sidi Aouidet (47 km from Siliana, road El Fahs-Siliana), 36°15'81"N, 9°46.46"E, alt. approx. 440 m, slope overgrown by conifers close to road, under stones, leaf litter, 28.III.2008, leg. P. Stoev and N. Akkari, holotype ♂ (MNHN CC 167), paratypes: 3 ♀ (MNHN CC 167), 2 ♀ (ZMUM), 1 ♀ (NMNH), 1 ♀ (ZMUC). Tunisia, Zaghouan Gov., Jebel Mansour, near Sidi Aouidet Village, 36°12'31"N, 9°45'59"E, alt. approx. 510 m. *Pinus* forest with *Rosmarinus officinalis* bushes, under stones and leaf litter, 28.III.2008, leg. N. Akkari and P. Stoev, paratypes: 6 ♀ (FMNH), 4 ♂, 1 ♀ (NMNH).

Name: To emphasize the colourful tergal pattern.

Diagnosis: Especially similar to *G. punica* and *G. flavomaculata*, based on the characteristic colour pattern (2+2 rows of spots on terga 2-11), but differs in the presence of a light axial line, of medially coalesced 1+1 spots on the pygidium and the lighter background coloration.

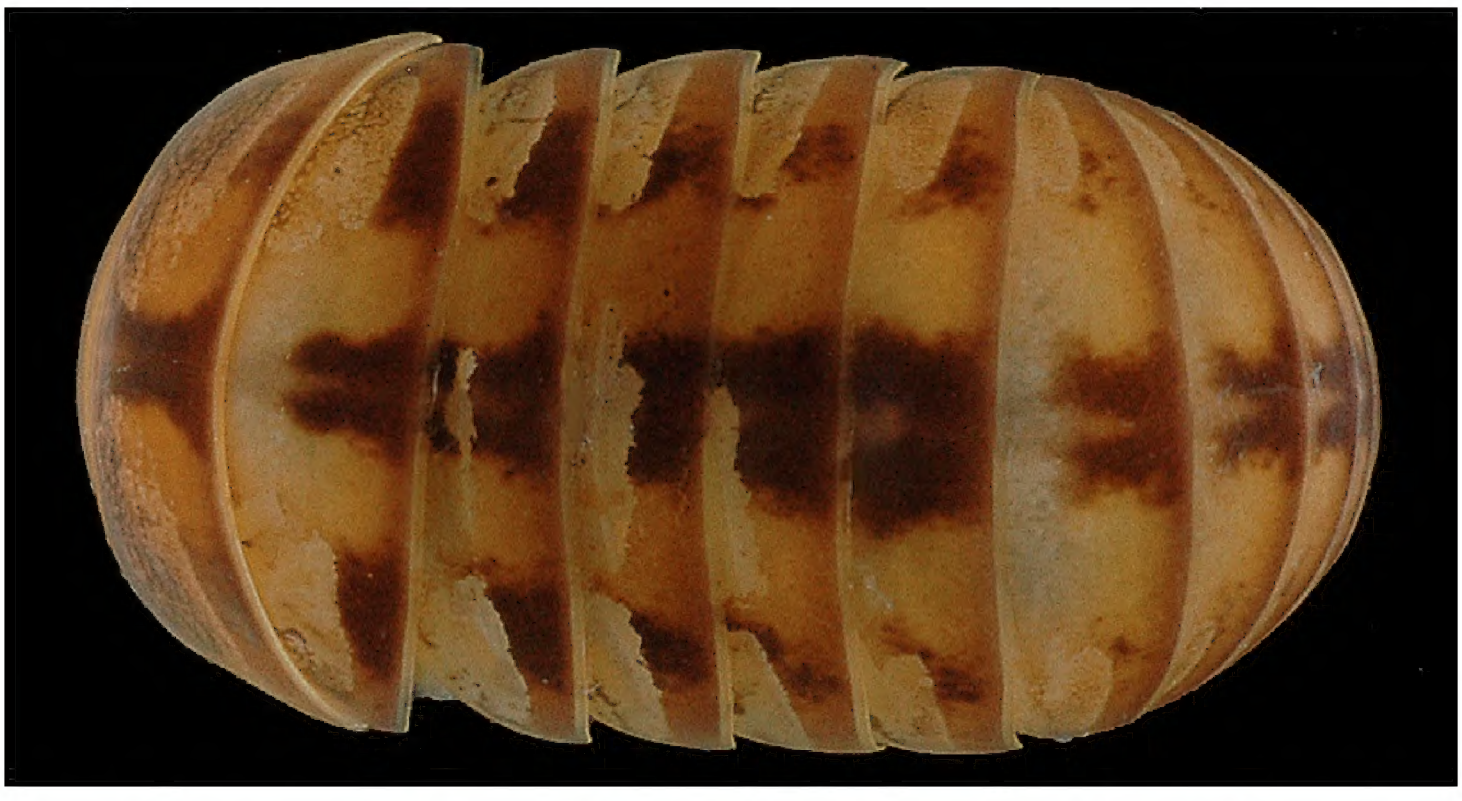

Figure 3. *Glomeris colorata* sp. n., ♀ paratype from Tunisia, Siliana Gov.; habitus, dorsal view. (Photographed not to scale by I. Muratov).

Description: Length of adults of both sexes (extended, alcohol material) ranging between 9.5 (♂) and 10.0-13.5 mm (♀), width between 4.7 (♂) and 5.0-6.7 mm (♀); body broadest at thoracic shield. Holotype ca 9.5 mm long and 4.7 mm wide.

Coloration (Figs 3, 4) variegated, mostly rather vivid, background usually dark brown, but sometimes mostly yellow due to expanded light spots. Head mostly light brown, evidently marbled near ocelli, with 1+1 and 2+2 small pallid spots against a light brown background just above antennal sockets; labrum pale yellowish; antennae largely dark brown, only tip pallid. Collum with a large, mostly marbled, yellowish central spot (Figs 3, 4). Thoracic shield with 2+2 large light spots, sometimes interconnected with a transversely oval marbled area in-between, but separated by a more or less evident, often incomplete, light axial line. Subsequent terga, except pygidium, with 1+1 more or less wide, light paramedian spots, usually arranged into clear stripes, a mostly interrupted and sometimes vague, light, axial line, and a pair of marbled, transversely oval, lateral areas. Pygidium with 1+1 light, paramedian, mostly coalesced spots (Fig. 4), less frequently nearly entirely light grey-brown. Venter and legs contrastingly light yellow.

Head usual, transverse; Tömösváry's organ transversely oval, slightly shorter than in *G. troglokabyliana* sp. n.; antennae long, antennomere 6 longest, 2.4-2.5 times longer than wide; ocelli (4)5 black + 1 transparent, all convex.

Collum with two transverse striae.

Thoracic shield with a narrow hyposchism almost reaching caudal tergal contour (Fig. 5A); four transverse striae, of which 1-2 anteriormost starting well in front of

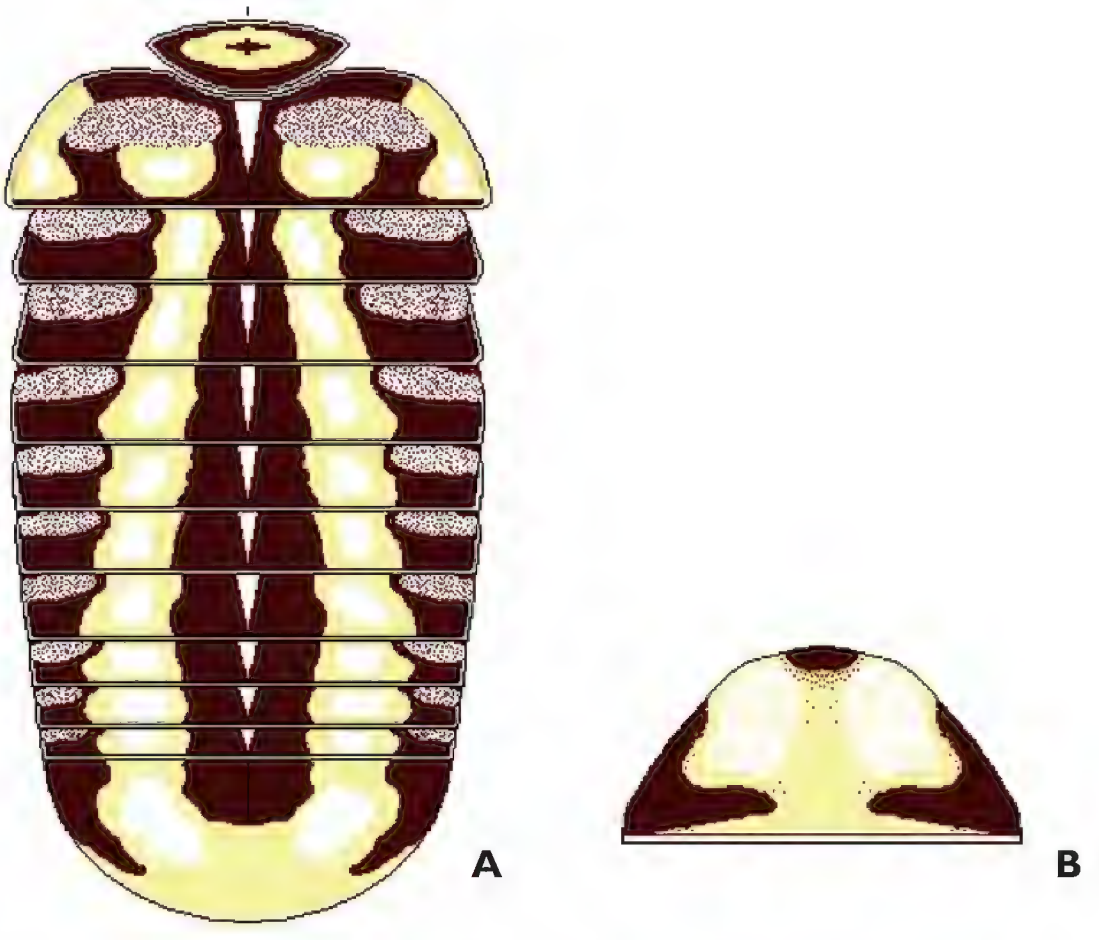

Figure 4. *Glomeris colorata* sp. n., ♂ holotype; **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too bright presentation of the colour pattern (del. J.-P. Mauriès).

schism and crossing entire dorsum, the other two always abbreviated (Fig. 5A); anteriormost stria only rarely slightly interrupted dorsally.

Tergum 3 relatively narrowly (Fig. 5A) and tergum 4 broadly rounded laterally. Tergal pilosity and mid-dorsal sinuosity absent. Pygidium usually with a completely regularly rounded caudal margin, only rarely extremely faintly sinuated medially at margin.

♂ leg 17 (Fig. 5B) with a low outer coxal lobe; telopodite 4-segmented.

♂ leg 18 (Fig. 5C) with a broadly subtriangular syncoxital notch; telopodite 4-segmented.

Telopods (Figs 5D) with a high, rather regularly rounded, bare, central syncoxital lobe flanked by two setose horns, latter each crowned with a minute bulb and a short setoid filament. Tarsus quite narrowly rounded apically.

Remarks: Based on the narrow tergum 3, *G. colorata* sp. n. can be attributed to the "*Stenopleuromeris*" type.

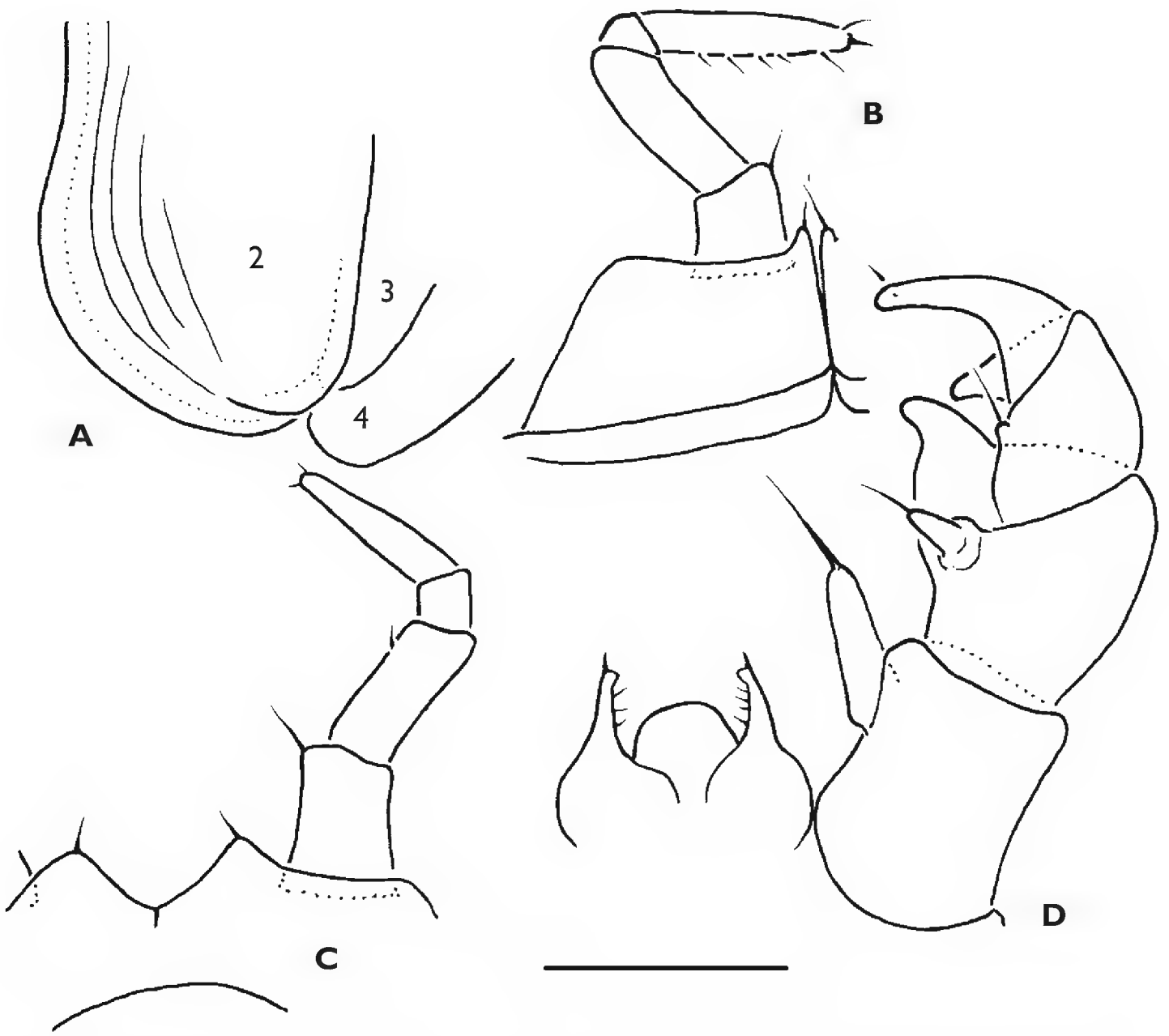

Figure 5. *Glomeris colorata* sp. n., ♂ holotype; **A**, thoracic shield and terga 3 and 4, lateral view; **B**, leg 17; **C**, leg 18; **D**, leg 19 (telopod), frontal view. – Scale bar: 0.5 mm (B-D); drawn not to scale (A).

Glomeris anisosticta Brandt, 1841

Glomeris pustulata Latr., var. *microstemma* Brandt, 1840b: 42 (D).
Glomeris pustulata Latr., var. *microstemma* – Brandt 1841b: 148 (R); Gervais 1847: 72 (R).
Glomeris pustulata Latr., var. *anisosticta* Brandt, 1841a: 284 (D).
Glomeris pustulata genuina (= *pustulata*), var. *microstemma* – Verhoeff 1906: 180 (R).
Glomeris anisosticta – Brolemann 1921: 100 (L); Schubart 1953: 218 (L).
Glomeris pustulata anisosticta – Abrous-Kherbouche & Mauriès 1996: 586 (L).

Remarks: Unfortunately, no new material of this species could be obtained for study. It is stated to be close to *G. pustulata*, but differs in the paramedian spots on the thoracic shield being much smaller than each lateral spot (Brandt 1840b, 1841a, b). For the time being, we treat this taxon as a full species, but its separation from *G. pustulata* remains to be confirmed.

Glomeris brolemanni Schubart, 1960

Glomeris brolemanni Schubart, 1960: 164, figs 1-3 (D).

Remarks: Unfortunately, no new material of this species could be obtained for study. It is stated to differ from congeners in having a black-brown ground coloration, with the thoracic shield showing only a single, large, pale spot in the anterior part, each of the subsequent terga showing a pair of light, lateral, transverse-oval spots, and the pygidium completely dark (except for the usual pale margin, which is slightly wider laterally) (Schubart 1960). It belongs to the "*Stenopleuromeris*" type.

Glomeris flavomaculata Lucas, 1846
Figs 6-9

Glomeris flavomaculata Lucas, 1846: 284 (D).
Glomeris flavo-maculata (sic!) – Gervais 1847: 74 (R); Lucas 1849: 326, plate 1, fig. 5 (R); Pocock 1892: 27 (F); Brolemann 1921: 101 (L); Schubart 1963: 80 (R).
Glomeris connexa C. Koch, v. *flavo-maculata* (sic!) – Silvestri 1896: 157 (F).
Glomeris flavomaculata – Schubart 1953: 218 (L); Abrous-Kherbouche & Mauriès 1996: 572, 586 (F, L).

Type material examined: Algeria, environs of Algiers, date ?, leg. et det. H. Lucas, ♂ lectotype (here designated) (MNHN CC 042), paralectotypes: 14 ♂, 19 ♀, 4 ♀ juv. (MNHN CC 042). Algeria, environs of Oran, 1846, leg. ?, det. H. Lucas, paralectotypes: 1 ♂, 2 ♀ (MNHN CC 042). The designation of a lectotype seems advisable in order to fix the type locality and to ensure that the name-bearing type shows the diag-

Figure 6. *Glomeris flavomaculata* Lucas, 1846, ♂ ?paralectotype; habitus, dorsal view. (Photographed not to scale by I. Muratov).

nostically important characteristics of the male sex, particularly as Lucas (1846) spoke about this species being common throughout Algeria.

Other material: Algeria, 1850, leg. H. Lucas, ?paralectotype ♂ (MNHN CC 042, entry 67-96). Algeria, Vallée des Singes, leg. & det. H. Ribaut, 2 ♂, 3 ♀ (MNHN CC 042).

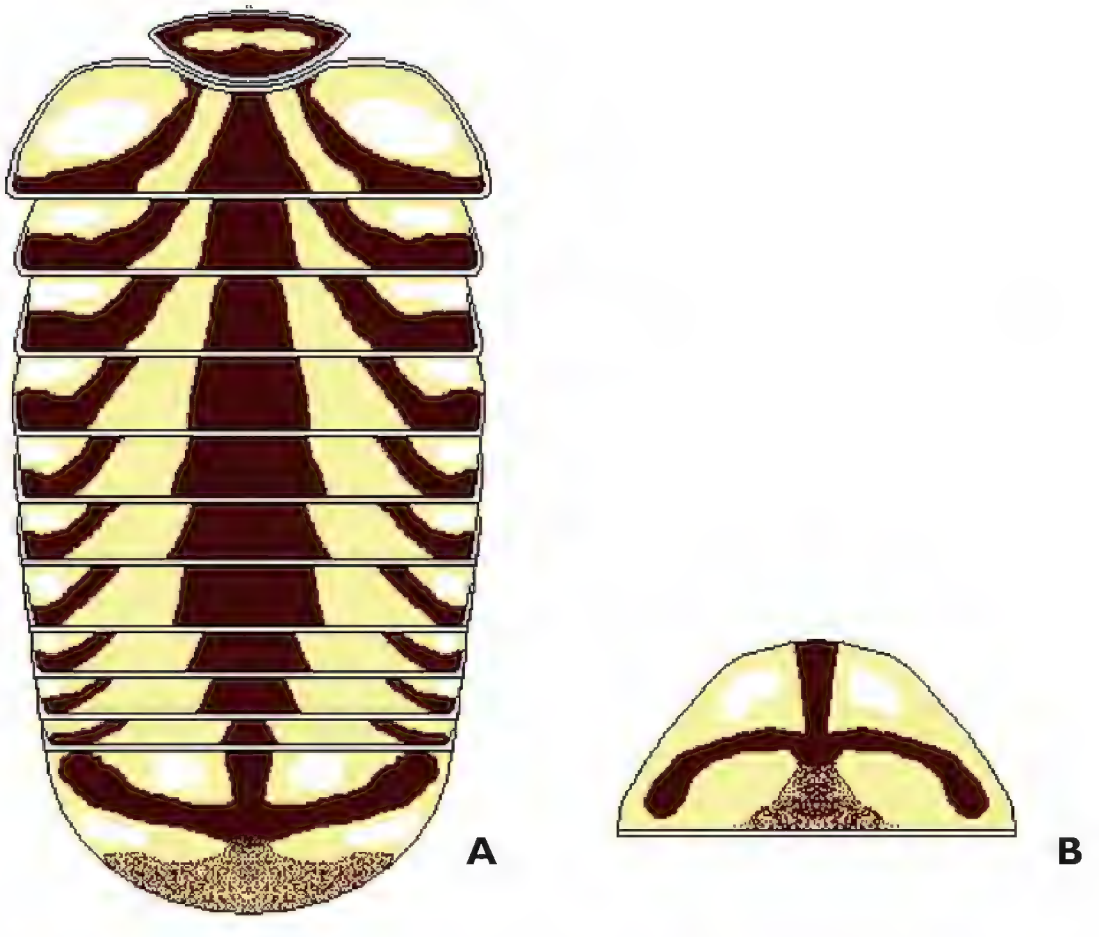

Figure 7. *Glomeris flavomaculata* Lucas, 1846, ♂ paralectotype; **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too bright presentation of the colour pattern (del. J.-P. Mauriès).

Figure 8. *Glomeris flavomaculata* Lucas, 1846, syntype; habitus, dorsal view. (after Lucas 1849).

Brief redescription: Length up to 15 mm, width up to 6.25 mm. Coloration vivid, pattern as in Figs 6-8. ♂ legs 17, 18 and 19 (telopods) as in Figs 9A-D.

Remarks: Nearly the entire type series of *G. flavomaculata* has faded completely, probably due to the long preservation in alcohol. Fortunately, however, the paralectotypes from near Oran and the ?paralectotype ♂ from Lucas' collection (1850) have retained their coloration (Figs 6, 7), which matches quite closely the pattern well depicted by Lucas (1849), based on a then rather freshly collected syntype (Fig. 8). We are certain, however, that all diplopods printed in colour by Lucas (1849) in Plate 1 are too dark and red compared to their natural coloration, not only because pertinent alcohol material shows this, but also in view of the specific name itself, *flavomaculata*, clearly indicating the presence of light spots on the body. The most likely explanation is that Lucas used dry material of *G. flavomaculata* which had become somewhat darkened (see also below).

This species belongs to the "*Stenopleuromeris*" type.

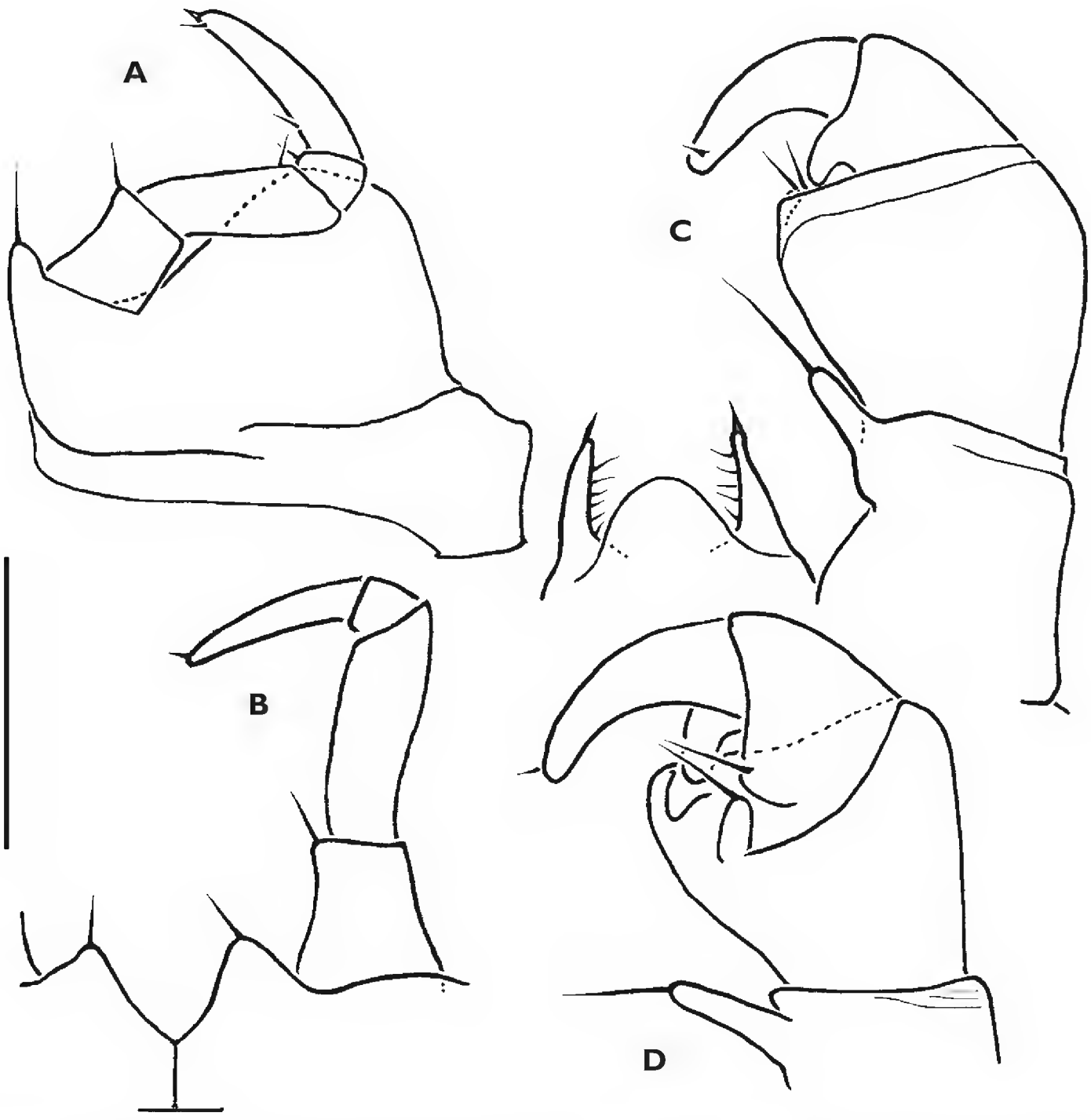

Figure 9. *Glomeris flavomaculata* Lucas, 1846, ♂ lectotype; **A**, leg 17; **B**, leg 18; **C, D**, leg 19 (telopod), caudal and frontal views, respectively. – Scale bar: 0.5 mm.

Glomeris klugii Brandt, 1833

Figs 10-14

Glomeris klugii Brandt, 1833: 195 (D).
Glomeris marmorata Brandt, 1833: 196 (D), **syn. n.!**
Glomeris fuscomarmorata Lucas, 1846: 284 (D), **syn. n.!**
Glomeris pustulata Latr., var. *marmorata* – Brandt 1840b: 42 (R); 1841b: 148 (R); Gervais 1847: 73 (R).
Glomeris fusco-marmorata (sic!) – Gervais 1847: 74 (R); Lucas 1849: 327, plate 1, fig. 4 (R); Pocock 1892: 27 (F); Brolemann 1921: 101 (L).
Glomeris conspersa forma *genuina* (sic!) – Attems 1908: 105 (F).

Glomeris fuscomarmorata – Schubart 1953: 218 (L); Abrous-Kherbouche & Mauriès 1996: 586 (L).
Glomeris maculosa Verhoeff, 1921: 27, fig. 3 (D), **syn. n.!**
Glomeris maculosa – Schubart 1953: 218 (L).
Glomeris conspersa – Abrous-Kherbouche & Mauriès 1996: 572, 586 (F, L).

Type material examined: Germany, "Hercynia", leg. Zimmermann, 2 ♀ ?syntypes of *Glomeris marmorata* Brandt, 1833 (ZMUB 39). No lectotype designation has been made here, particularly as we did not directly examine the material.

Algeria, Philippeville (now Skikda), date ?, leg. et det. H. Lucas, 1 ♀ syntype ("type") of *Glomeris fuscomarmorata* (MNHN CC 043).

Algeria, Gorges de la Chiffa, date ?, leg. H. Ribaut, ♂ "type" of *Glomeris maculosa* Verhoeff, 1921 (ZSM A20070924 + micropreparation A20032085). The ♂ represents only part of the syntype series, which was said to consist of 2 ♂ and 1 ♀ (Verhoeff 1921).

Other material (nearly all previously identified as *Glomeris fuscomarmorata*): Algeria, "Bona" (now Annaba), leg. F. Meinert, 5 ♀ (ZMUC). Algeria, le Ruisseau (environs of Algiers), 18.XII.1892, leg. P. Lesne, 2 ♀ (MNHN CC 168, entry 6-97). Algeria, Ravin de la Femme Sauvage (environs of Algiers), XII.1892, leg. P. Lesne, 2 ♂, 2 ♀ (MNHN CC 168, entry 6-97). Algeria, loc. ?, 1898, leg. Noucelhier, 1 ♂, 3 ♀ (MNHN CC 168). Algeria, Massif de l'Edough, VII-VIII.1918, leg. Ed. Ch. (?), 1 ♂ juv., 4 ♀ (MNHN CC 168). Algeria, near Algiers, ruisseau des Singes, date ?, leg. et det. H. Ribaut, 1 ♂, 1 ♀, 1♀ juv. (MNHN CC 043). Algeria, Algiers, 3.IV.1907, leg. et det. H. Ribaut, 2 ♀ (MNHN CC 043). Tunisia (Khroumirie), Jendouba Gov., Aïn Draham, V-VI.1906, leg. H. Gadeau de Kerville, 1 ♂ (MNHN CC 043). Same locality, Aïn Draham, Col des Ruines, 36°47'N, 8°41'E, 19.XI.2003, leg N. Akkari, 1 ♀ (NMNH). Same locality, 5.II.2004, leg N. Akkari, 3 ♀ (ZMUM). Same locality, 19.XI.2003, leg N. Akkari, 1 ♀ (NMNH). Same locality, 18.IV.2004, leg. N. Akkari, 1 juv. (ZMUM). Same locality,

Figure 10. *Glomeris klugii* Brandt, 1833, ♀ from Tunisia, Aïn Draham area (ZMUC 200107); habitus, dorsal view. (Photographed not to scale by I. Muratov).

alt. approx. 735 m, 9.III.2009, leg. N. Akkari and H. Enghoff, 1 ♀ (ZMUC). Same locality, alt. approx. 710 m, 11.III.2009, leg. N. Akkari and H. Enghoff, 3 ♂, 1 ♂ juv., 11 ♀ (ZMUC). Same locality, Aïn Draham area, 5-18.V.1988, leg. Z. M. Cop. Exp., 3 ♂, 2 ♀ (ZMUC 200107). Same locality, 7 km S of Aïn Draham, Les Chênes, 22.03.1986, leg. Z. M. Cop. Exp., 2 ♂, 6 ♀ (ZMUC 200109). Same locality, Fernana, 36°43'59"N, 8°40'43"E, alt. approx. 750 m, *Quercus-Erica* forest, 9.III.2009, leg. N. Akkari and H.

Figure 11. *Glomeris klugii* Brandt, 1833, both ♀ ?syntypes of *G. marmorata* Brandt, 1833 from "Hercynia" (ZMUB); **A & B**, habitus, dorsal view. (Photographed not to scale by A. Friederichs).

Enghoff, 2 ♂ juv., 3 ♀ (ZMUC). Same locality, Aïn Draham, Beni M'Tir, 36°43'51"N, 8°42'19"E, alt. approx. 590 m, *Quercus-Erica* forest, 10.III.2009, leg. N. Akkari and H. Enghoff, 2 ♂, 1 ♂ juv., 2 ♀ (ZMUC).

Brief redescription: Length up to 13.5 mm, width up to 6.25 mm. Coloration mostly vivid, very distinctly marbled, pattern as in Figs 10-13. Syncoxite of telopods as in Figs 14A, B, with only minor variations in shape of central lobe and in delicately bifid coxal horns.

Remarks: The presumed type series of *G. marmorata*, even though represented by two dry, pinned specimens, has still preserved its colour pattern sufficiently well (Fig. 11) to compare it with the beautiful illustrations by Koch (1863) and hence to unequivocally synonymize this species here with *G. klugii*, the holotype of which has been revised elsewhere (Golovatch 2003). This formalizes Brolemann's (1921) informal synonymy "*G. conspersa* C. Koch, 1847 (= *marmorata*)" proposed in his checklist.

The syntype of *G. fuscomarmorata* examined here has faded completely, apparently due to the long preservation in alcohol. Fortunately, most of the other samples from North Africa, especially fresh ones, have retained their coloration (Figs 10, 12), which matches quite closely the pattern depicted by Lucas (1849), based on a then recently collected syntype (Fig. 13). We are certain, however, that this species must also have been printed somewhat too dark and red compared to its natural coloration in Lucas' (1849) Plate 1, likely because Lucas used dry material (cf Figs 11 and 13). On the other hand, *G. klugii* in Europe is known to exist in two colour morphs, the dark "*undulata*" and the light "*conspersa*" (Hoess 2000), of which "*conspersa*" is much more widespread

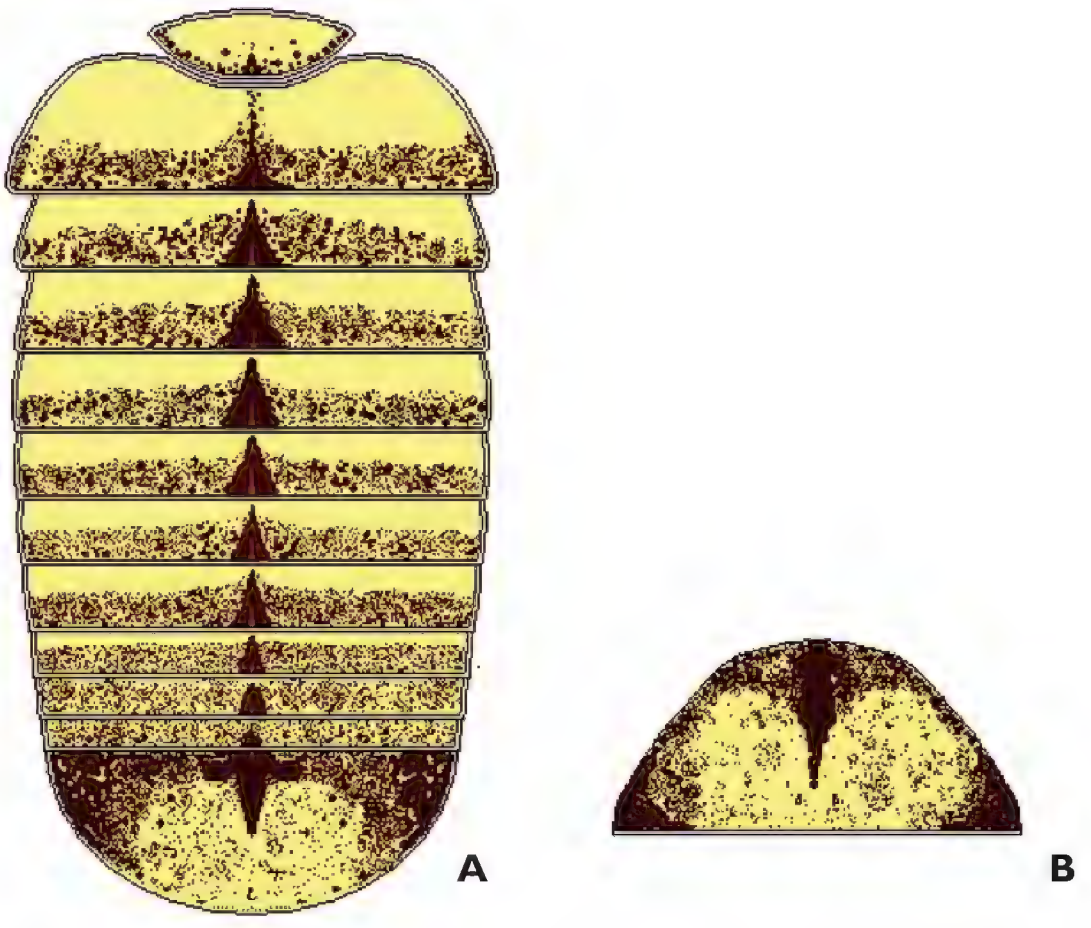

Figure 12. *Glomeris klugii* Brandt, 1833, ♀ from Tunisia, Aïn Draham area (MNHN CC 168); **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too bright presentation of the colour pattern (del. J.-P. Mauriès).

Figure 13. *Glomeris klugii* Brandt, 1833, ♀ syntype of *G. fuscomarmorata* Lucas, 1846 from Algeria. (after Lucas 1849).

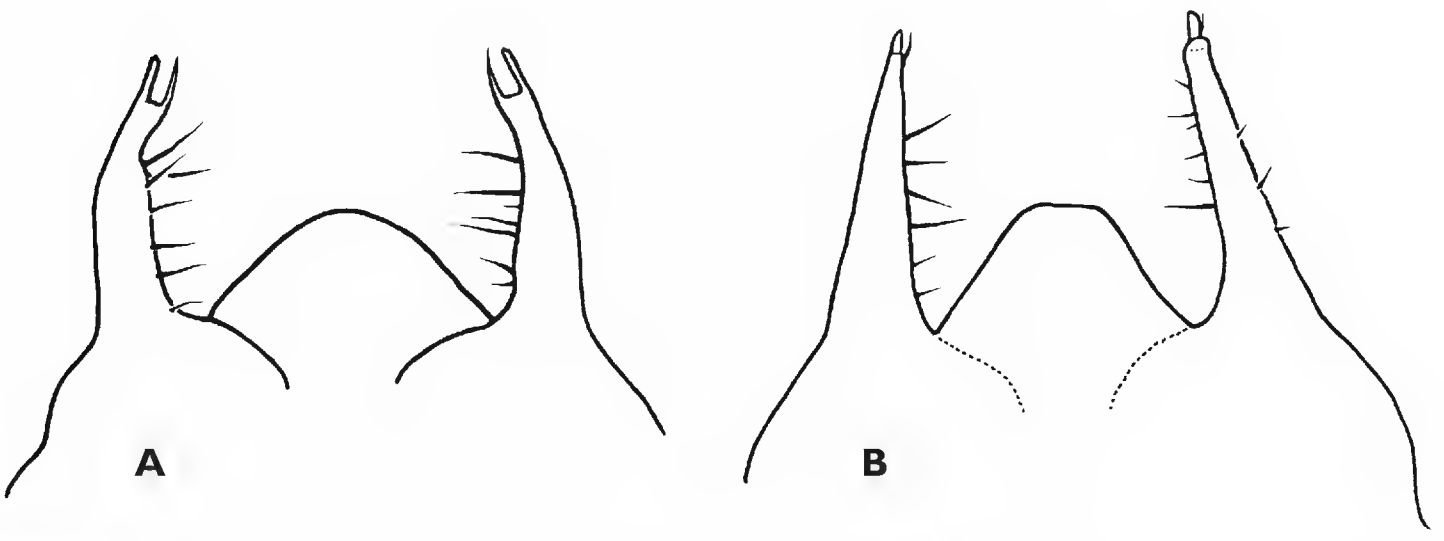

Figure 14. Telopod syncoxite of *Glomeris klugii* Brandt, 1833; **A**, ♂ from near Algiers, ruisseau des Singes (MNHN CC 043); **B**, ♂ from Tunisia, Aïn Draham area (ZMUC 200107), both previously identified as *G. fuscomarmorata* Lucas, 1846. – Drawn not to scale.

and occupies peripheral parts of the species' distribution area, including North Africa. Could material of "*undulata*" have served, at least in part, for Lucas' (1846, 1849) descriptions and illustrations? Hoess (2000) marked as questionable populations of "*conspersa*" from a few small, outlying areas in the Balkans, near Algiers and Tunis, but we can confirm the presence of *G. klugii* in North Africa. We suggest that it could well have arrived there, particularly at the largest sea ports, through commercial activities, which have been going on since prehistoric times throughout the Mediterranean. The synonymy of *G. klugii* and *G. fuscomarmorata* proposed here therefore appears fully justified.

Furthermore, we must give due tribute to Brandt (1840b, 1841a, b) who, already at the very beginning of diplopodological explorations in North Africa, wrote that his *G. marmorata* from Germany and Algeria were identical. Although he failed to recognize that his own *G. klugii* and *G. marmorata* actually represented the same species—apparently because the holotype of *G. klugii* (surprisingly) did not show any striae on the thoracic shield, retained (in alcohol) its generally light coloration and was thought to have come from Egypt or Syria—he was essentially correct in thinking that the same species could exist on both continents. Likewise correct have been the very few subsequent records of "*conspersa*" in Algeria and Tunisia (Attems 1908; Abrous-Kherbouche and Mauriès 1996), whereas most other authors believed that the North African fauna, including that of *Glomeris*, is fully endemic.

The syntype of *G. maculosa* is a "*conspersa*" specimen of *G. klugii*, with the colour pattern still well traceable. Hence the synonymy of these names is also proposed here.

The fact that *G. klugii* belongs to the "*Eurypleuromeris*" type provides an additional indication of its probable introduction to North Africa from Europe. Moreover, even though *G. conspersa* is the type-species of *Eurypleuromeris*, Verhoeff (1921) mistakenly attributed his *G. maculosa* to the "*Stenopleuromeris*" type. Indeed, the anterior part of tergum 3 in the syntype of *G. maculosa* that we have examined is probably a little narrower than is usual for European or other North African "*conspersa*" specimens of *G. klugii*, but this variation seems too modest to be considered a reliable distinction, perhaps even reflecting individual rather than geographical variation. This is another good reason to abandon the subgeneric division of *Glomeris*.

Glomeris sublimbata **Lucas, 1846**

Figs 15-19

Glomeris sublimbata Lucas, 1846: 284 (D).

Glomeris sublimbata – Gervais 1847: 74 (R); Lucas 1849: 324, plate 1, fig. 3 (R); Brolemann 1913a: 388, fig. 1 (R); 1921: 101 (L); Schubart 1953: 218 (L); Abrous-Kherbouche & Mauriès 1996: 586 (L).

Glomeris connexa C. Koch, v. *sublimbata* (sic!) – Silvestri 1896: 156 (F).

Type material: Algeria, Philippeville (now Skikda), date ?, leg. et det. Lucas ?, ♂ lectotype (here designated) (MNHN CC 094), paralectotypes: 1 ♂, 4 ♀ (MNHN CC

Figure 15. *Glomeris sublimbata* Lucas, 1846, ♂ from Tunisia, Aïn Draham area; habitus, lateral view. (Photographed not to scale by N. Akkari).

094). The designation of a lectotype seems advisable in order to fix the type locality and to ensure that the name-bearing type shows the diagnostically important characteristics of the male sex, particularly as Lucas (1846) spoke about this species being recorded from several localities in Algeria.

Other material: Algeria, loc. ?, date ?, leg. H. Lucas?, ?paralectotypes: 1 ♂, 4 ♀ (MNHN CC 094). Algeria, loc. ?, 1850, leg. Lucas, 1 M (MNHN CC 094, entry 67-96). Algeria, "Bona" (now Annaba), leg. F. Meinert, 4 ♂, 22 ♀ (ZMUC). Algeria, Constantine, date ?. leg. M. Hénon, 1 ♀ (MNHN CC 094). Algeria, Philippeville (now Skikda), 1902, leg. Théry, 2 ♀, 1 juv. (MNHN CC 094). Algeria, Mt Babor, between Sétif and Bougie (now Béjaia), date ?, leg. P. de Peyerimhoff , 1 ♀ (MNHN CC 094). Algeria, Guerrounchi Forest, date ?, leg. ?, 5 ♂, 20 ♀ (MNHN CC 094). Algeria, date ?, leg. I. de Gaulle, 1 ♀ (MNHN CC 094). Algeria, ruisseau des Singes, date ?, leg. ?, 2 ♀ juv. (MNHN CC 094). Tunisia, Béja Gov., Jebel El Jouza, close to Amdoun Village, mixed oak forest dominated by *Quercus suber*, 36°49'N, 9°E, alt. approx. 560 m, under stone, 25.V.2005, leg. N. Akkari, 1 ♀ (NMNH). Same locality, in litter and under barks, 5.II.2004, leg. N. Akkari, 8 ♂, 7♀, 1 juv. (NMNH). Same locality, 4.XI.2003, leg. N. Akkari, 1 ♀, 1 juv. (ZMUM). Same locality, 25.XII.2003, leg. N. Akkari, 3 ♂, 1 ♀ (ZMUM). Tunisia, Jendouba Gov., Aïn Draham, Col des Ruines, in litter, 19.XI.2003, leg. N. Akkari, 2 ♀

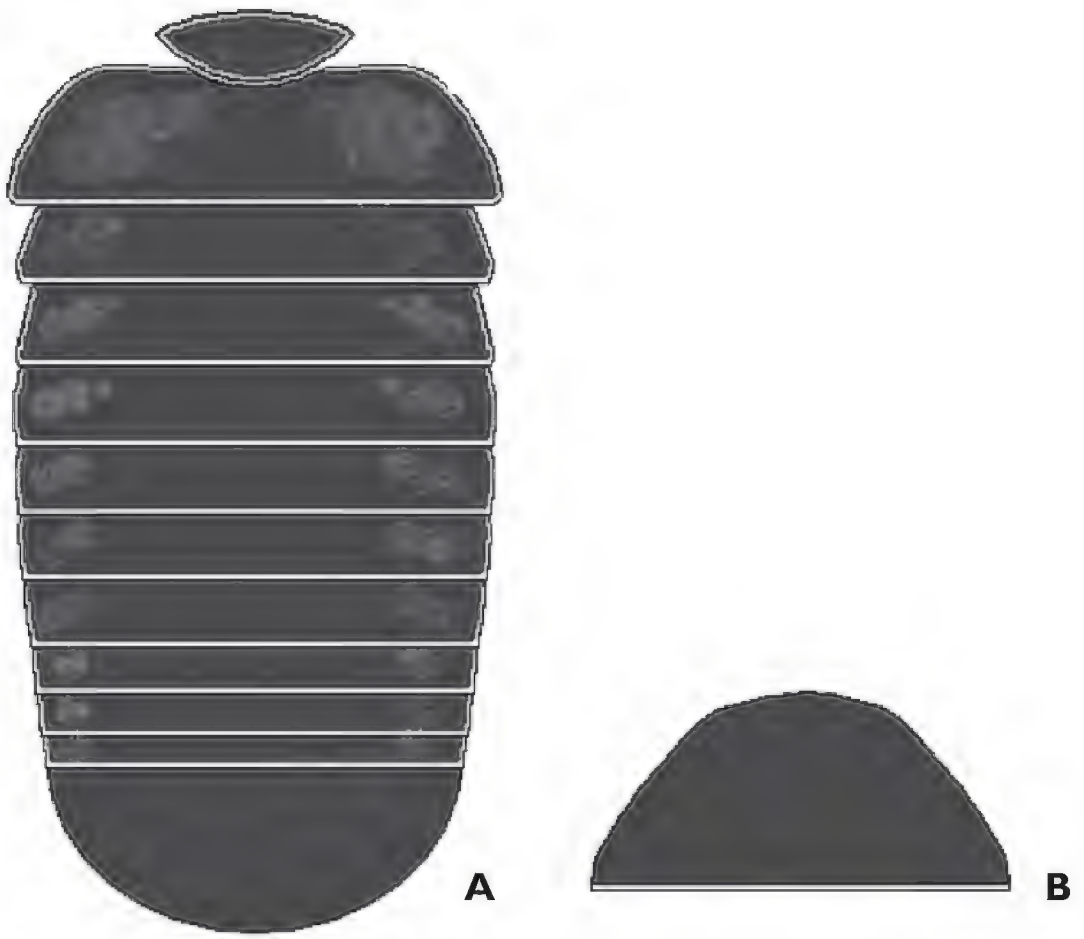

Figure 16. *Glomeris sublimbata* Lucas, 1846, ♂ from Algeria, Guerrounchi Forest (MNHN CC 094); **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too vague presentation of the colour pattern (del. J.-P. Mauriès).

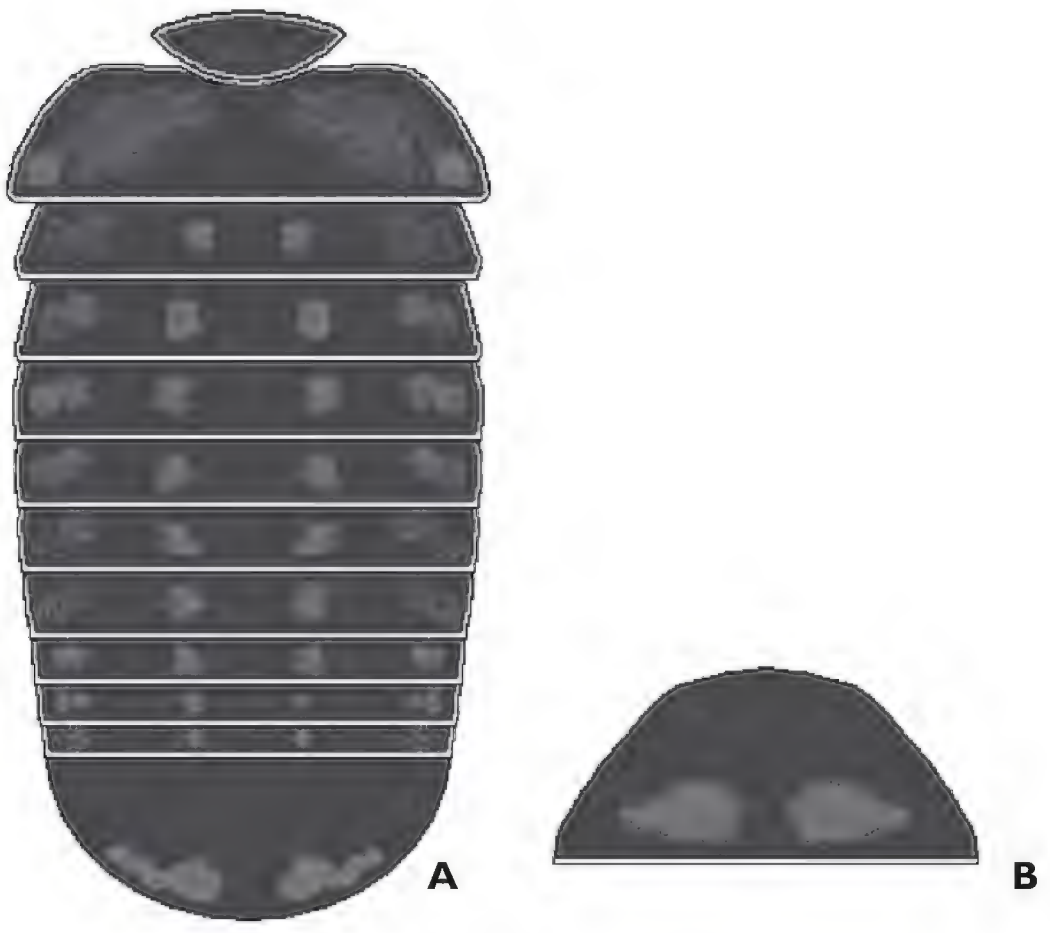

Figure 17. *Glomeris sublimbata* Lucas, 1846, juvenile ♀ from Algeria, ruisseau des Singes (MNHN CC 094); **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too vague presentation of the colour pattern (del. J.-P. Mauriès).

(NMNH). Same locality, in litter, 18.IV.2004, leg. N. Akkari, 1 ♀ (NMNH). Tunisia, Jendouba Gov., Feija National Park, oak forest with mixed *Quercus faginea* and *Q. suber*, 36°29'N, 8°18'E, in litter, 7.III.2004, leg. N. Akkari, 2 ♂, 1 ♀ (MNHN CC 094). Same locality, alt. approx. 690 m, in litter, 26.XII.2003, leg. N. Akkari, 2 ♂ (NMNH). Tunisia, Jendouba Gov., 15 km of Tabarka, 36°49'97"N, 8°42'34"E, alt. approx. 230 m, *Quercus* forest, slope, under stones and barks, 21.III.2008, leg. N. Akkari and P. Stoev, 3 ♂, 3 ♀ (MNHN CC 094). Tunisia, Béja Gov., Djebel El Jouza, 10.III.2005, leg. et det. N. Akkari, 2 ♂, 1 ♀ (ZMUC 200112). Tunisia, Jendouba Gov., Aïn Draham area, 5-18.V.1988, leg. Z. M. Cop. Exp., 1 ♀ (ZMUC 200107). Tunisia, Jendouba Gov., 7 km S of Aïn Draham, Les Chênes, 22.III.1986, leg. Z. M. Cop. Exp., 1 ♀ (ZMUC 200109). Tunisia, Béja Gov., Djebel Jouza, Amdoun, 2003, coll. N. Akkari, 2 ♀ (MNHN CC 094). Tunisia, Jendouba Gov., 15 km of Tabarka, 36°49'97"N, 8°42'34"E, alt. approx. 230 m, *Quercus suber* forest, slope, under stones and barks, 21.III.2008, coll. P. Stoev and N. Akkari, 2 ♂, 1 ♀ (FMNH). Tunisia, Jendouba Gov., 9 km of Hammam Bourguiba (W of Aïn Draham), 36°48'05"N, 8°39'54"E, alt. approx. 380 m, humid *Pinus* forest, close to river, under stones, logs and in leaf litter, 22.III.2008, leg. P. Stoev and N. Akkari, 8 ♂, 10

Figure 18. *Glomeris sublimbata* Lucas, 1846, syntype from Algeria. (after Lucas 1849).

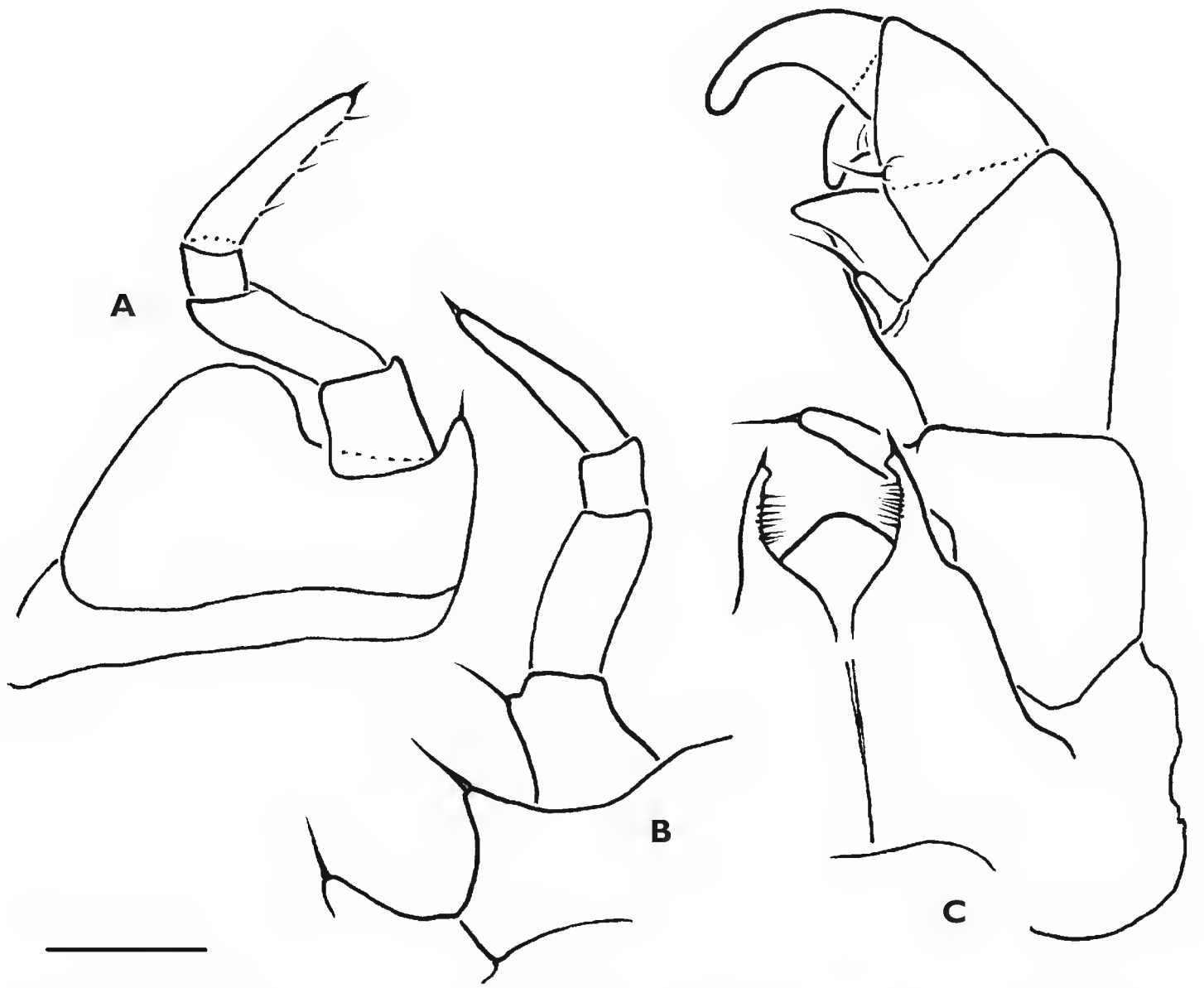

Figure 19. *Glomeris sublimbata* Lucas, 1846, ♂ lectotype; **A**, leg 17; **B**, leg 18; **C**, leg 19 (telopod), frontal view. – Scale bar: 0.5 mm.

♀, 1 ♀ juv. (FMNH). Tunisia, Jendouba Gov., 4 km of Tabarka (direction to Melloula), 36°57'48"N, 8°43'78"E, alt. approx. 225 m, *Eucalyptus* and *Pinus* forest, under stones, 22.III.2008, leg. P. Stoev and N. Akkari, 1 ♂ 1 ♀ (FMNH). Tunisia, Béja Gov., 13 km of Nefza (road Tabarka-Nefza), 36°57'61"N, 8°56'51"E, alt. approx. 150 m, *Pinus* forest, under stones, 23.III.2008, leg. P. Stoev and N. Akkari, 3 ♂, 3 ♀, 1 ♀ juv. (FMNH). Tunisia, Jendouba Gov., W of Babouch (near frontier to Algeria), 36°48'20"N, 8°39'29"E, alt. approx. 400 m, *Erica-Pinus* or *-Quercus* forest, 11.III.2009, leg. N. Akkari and H. Enghoff, 1 ♂ juv., 1 ♀ (ZMUC). Tunisia, Jendouba Gov., Aïn Draham, Col des Ruines, 11.III.2009, leg. N. Akkari and H. Enghoff, 1 ♀ (ZMUC). Tunisia, Jendouba Gov., Aïn Snoussi, close to Tabarka, 36°50'12"N, 8°54'41"E, alt. approx. 420 m, *Erica-Quercus* forest, 11.III.2009, leg. N. Akkari and H. Enghoff, 3 ♀ (ZMUC). Tunisia, Jendouba Gov., Tbainia (on road Béja-Aïn Draham), 36°47'06"N, 8°45'08"E, alt. approx. 575 m, *Erica-Quercus* forest, 11.III.2009, leg. N. Akkari and H. Enghoff, 3 ♀ (ZMUC).

Short description: Length up to 20 mm, width up to 10 mm. Coloration always brown-blackish, with 1+1 (adults) or 2+2 (some adults and all juveniles), more or less vague, greyish to brownish, marbled, lateral spots on terga 2(3)-11(12), pattern as in Figs 15-18. ♂ legs 17, 18 and 19 (telopods) as in Figs 19A-C.

Remarks: The type series of *G. sublimbata* has faded completely, probably due to the long preservation in alcohol. Fortunately, most of the other samples from North Africa, especially fresh ones, have retained their coloration (Figs 15-17), which matches quite closely the pattern depicted by Lucas (1849), based on a then recently collected syntype (Fig. 18). We are certain, however, this species in Lucas' (1849) Plate 1 was also printed or painted too dark compared to its natural coloration, since most probably Lucas used dry material which had become somewhat darkened.

This species is certainly among the largest and darkest in North Africa. It resembles the widespread and similarly uniformly very dark Western European *G. marginata* (Villers, 1789), yet *G. sublimbata* belongs to the "*Stenopleuromeris*" type. On the other hand, the degree of development of the anterior part of tergum 3 in relation to its posterior part may again prove to vary even intraspecifically, as is apparently the case in *G. klugii* (see above).

Glomeris carthaginiensis Schubart, 1953

Figs 20-23

Glomeris pustulata trisulcata Brolemann, 1925: 65 (D), nom. praeocc.
Glomeris pustulata carthaginiensis Schubart, 1953: 222 (N), **nom. n.**

Type material: Tunisia, Bizerte Gov., Djebel Ichkheul (near Mateur), 29.IX.1924, leg. L. Seurat, ♂ lectotype of *Glomeris pustulata trisulcata* Brolemann, 1925 (here designated) (MNHN CC 098, Brolemann n° 2629), paralectotypes: 1 ♂, 3 ♀ (MNHN CC 098, Brolemann n° 2629), det. H. Brolemann. The designation of a lectotype seems advisable in order to ensure that the name-bearing type shows the diagnostically important characteristics of the male sex.

Other material: Tunisia, Bizerte Gov., Ichkeul National Park (plain of Mateur), inside the park, 37°08'30"N, 9°41'03"E, under stones, 7.I.2005, leg. N. Akkari, 3 ♀, 1 juv. (ZMUC). Same locality, under stones, 24.IX.2006, leg. N. Akkari, 1 ♂, 1 ♀ (NMNH). Same locality, alt. approx. 50 m, under stones, 23.III.2008, leg. N. Akkari and P. Stoev, 1 ♂, 10 ♀, 4 juv. (MNHN CC 098), 1 ♂, 4 ♀, 2 juv. (ZMUC), 3 ♀, 2 juv. (NHMW 7780). Same locality, under stones, 8.III.2004, leg. N. Akkari, 1 ♂, 7 ♀, 1 juv. (ZMUM). Same locality, under stones, 3.XII.2006, leg. N. Akkari, 3 ♀ (ZMUM). Same locality, 12.III.2009, leg. N. Akkari and H. Enghoff, 3 ♂, 8 ♀ (ZMUC). Same locality, 27.III.2007, leg. F. Vilisics, 1 ♂ (HNHM).

Short description: Length up to 17 mm, width up to 7.5 mm. Coloration blackish, with a characteristic pattern of 2+2 light spots on thoracic shield and, occasionally, also on terga 3 and 4, but always with a pair 1+1 light and especially large spots both on tergum 6 and pygidium; no light markings on terga 7-11 (Figs 20-22). ♂ legs 17, 18 and 19 (telopods) as in Figs 23A-C.

Remarks: This taxon is here considered to be a full species. The type series, said to have originally consisted of 13 specimens of both sexes (Brolemann 1925), is now

Figure 20. *Glomeris carthaginiensis* Schubart, 1953, ♂ topotype; **A**, **B**, dorsal and lateral views, respectively, of a rolled animal. (Photographed not to scale by N. Akkari).

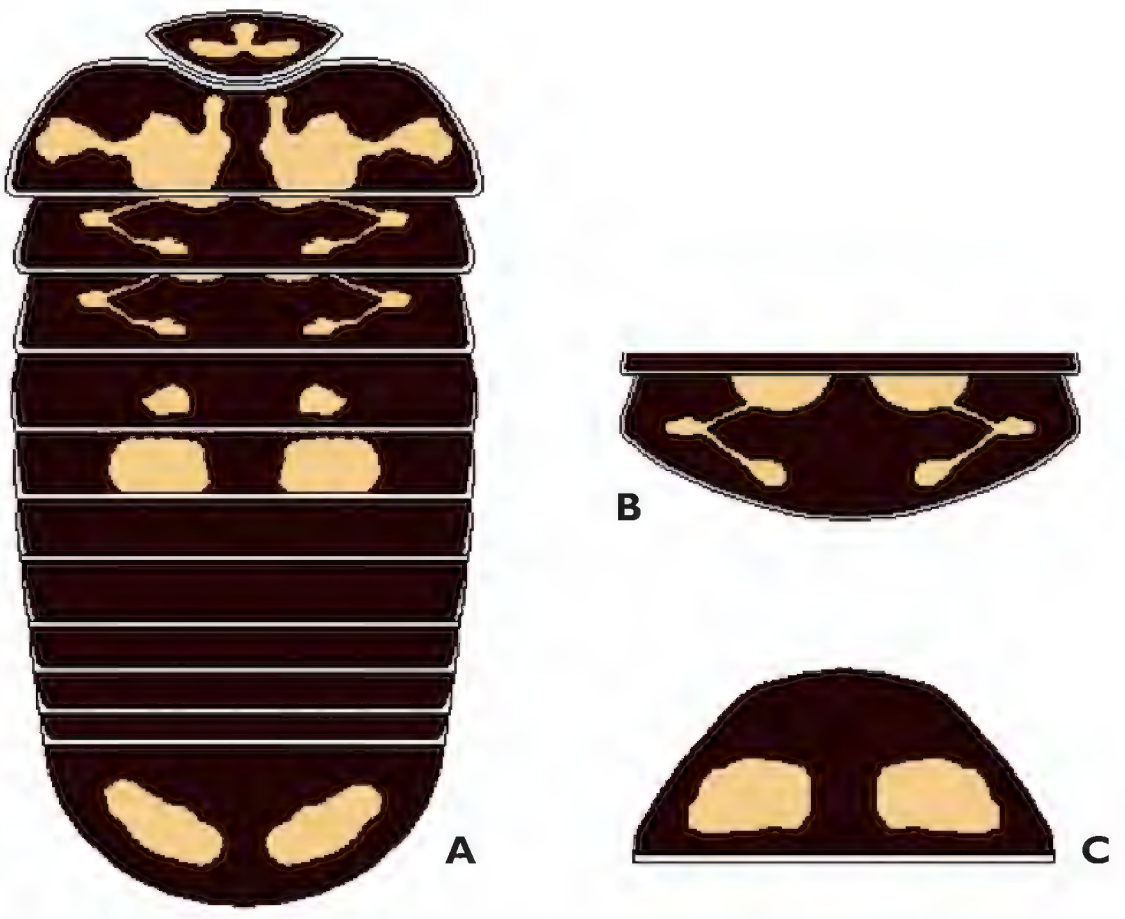

Figure 21. *Glomeris carthaginiensis* Schubart, 1953, ♂ topotype; **A**, habitus, dorsal view; **B**, pygidium, dorsal view; **C**, pygidium, caudal view. A schematic, slightly too bright presentation of the colour pattern (del. J.-P. Mauriès).

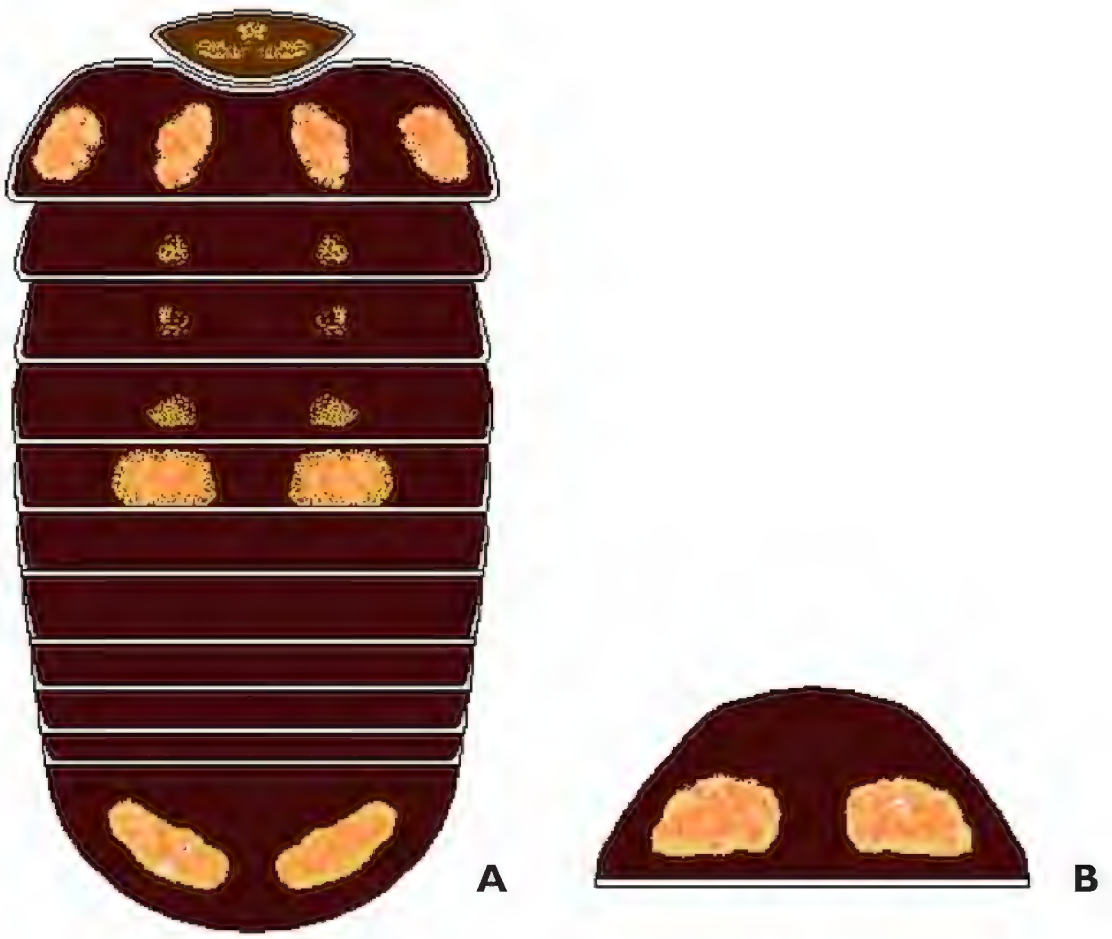

Figure 22. *Glomeris carthaginiensis* Schubart, 1953, ♂ topotype; **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too bright presentation of the colour pattern (del. J.-P. Mauriès).

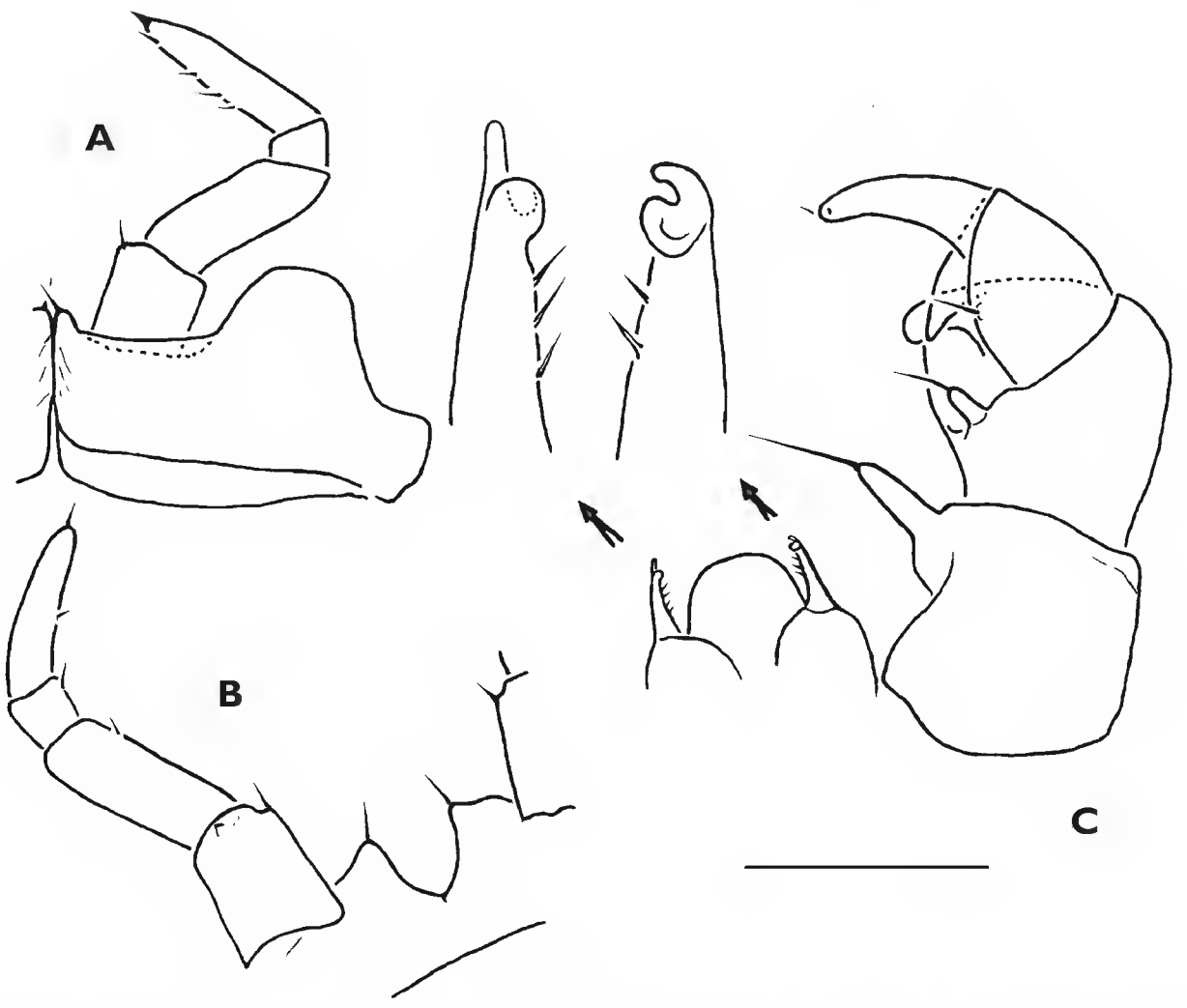

Figure 23. *Glomeris carthaginiensis* Schubart, 1953, ♂ lectotype; **A**, leg 17; **B**, leg 18; **C**, leg 19 (telopod), frontal view. – Scale bar: 0.5 mm.

incomplete (only 5 specimens left), and strongly faded, but still with a detectable colour pattern. Variation in coloration and pattern modest, the most characteristic feature being the presence of a paramedian pair of especially large, light spots on tergum 6 and a complete absence of lighter markings thereafter until the pygidium (Figs 20-22).

This species belongs to the "*Stenopleuromeris*" type.

Glomeris mohamedanica Attems, 1900

Figs 24, 25

Glomeris europaea striata var. *mohamedanica* Attems, 1900: 303 (D).
Glomeris mohamedanica – Schubart 1953: 218 (L).

Type material: Tunisia, Béja Gov., Medjez El Bab (now Mejez El Bab), date ?, leg. ?, ♂ lectotype (here designated) (NHMW 3913), paralectotypes: 3 ♂, 2 ♀ (NHMW 3913), 1 ♂ (MNHN CC 153). The designation of a lectotype (from 350 syntypes, see Attems 1900) seems advisable in order to ensure that the name-bearing type shows the diagnostically important characteristics of the male sex.

Other material: Tunisia, Béja Gov., Nefza (30 km of Béja), 2003, leg. N. Akkari, 1 ♂, 1 ♀ (MNHN CC 153). Same locality, 36°57'61"N, 8°56'51"E, open area with scattered vegetation, under stones, 27.II.2004, leg. N. Akkari, 3 ♂, 5 ♀, 3 juv. (MNHN CC 153). Same locality, 2.X.2005, leg. N. Akkari, 1 ♂, 3 ♀ (NMNH). Tunisia, Jen-

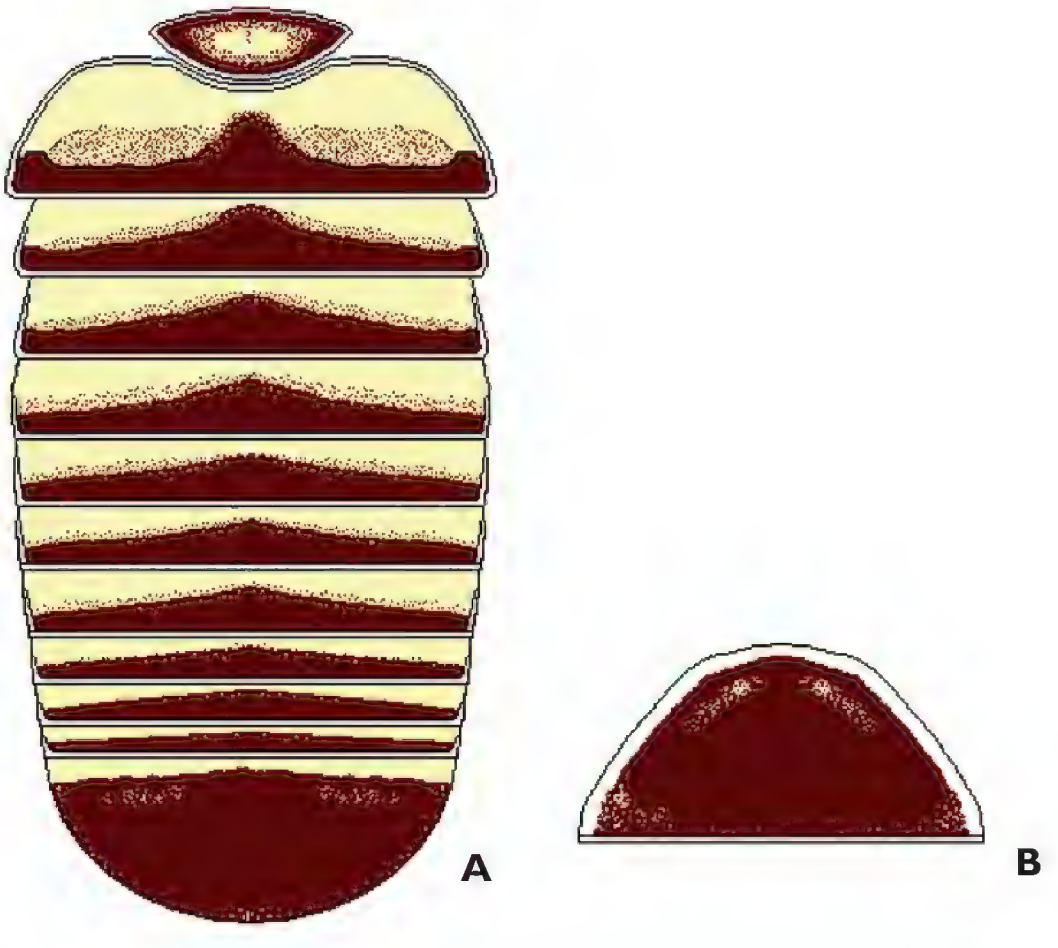

Figure 24. *Glomeris mohamedanica* Attems, 1900, ♂ from Tunisia, Nefza; **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too bright presentation of the colour pattern (del. J.-P. Mauriès).

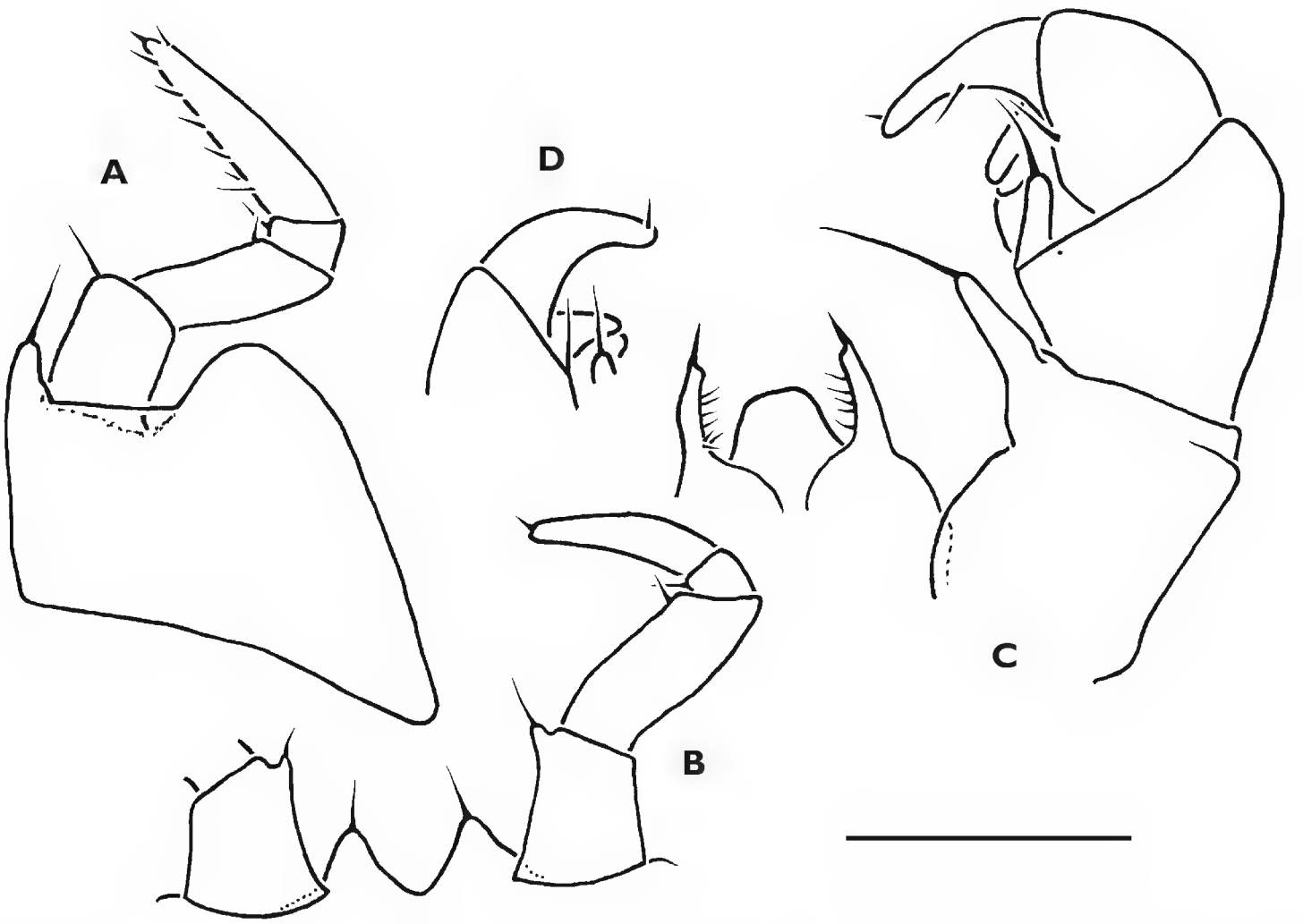

Figure 25. *Glomeris mohamedanica* Attems, 1900, ♂ lectotype; **A**, leg 17; **B**, leg 18; **C**, leg 19 (telopod), frontal view; **D**, distal part of telopod, caudal view. – Scale bar: 0.5 mm.

douba Gov., Beni Mtir (8 km S of Aïn Draham), mixed oak forest dominated by *Quercus suber*, slope, under stones, 19.II.2007, leg. N. Akkari, 10 ♂ (MNHN CC 153), 3 ♂ (ZMUM), 2 ♂ (NMNH), 2 # (FMNH). Same locality, alt. approx. 500 m, 19.II.2007, leg. N. Akkari, 2 ♂, 2 ♀ (ZMUC 200113). Tunisia, Jendouba Gov., Tabarka, 10.XII.2003, leg. N. Akkari, 1 ♀ (FMNH). Tunisia, Jendouba Gov., 40 km of Jendouba, near frontier, 17.V.1988, leg. Z. M. Cop. Exp., 2 M (ZMUC 200108).

Short description: Length up to 12 mm, width up to 6.0 mm. Coloration dark brown to blackish, with contrasting yellow bands, pattern as in Figs 24A, B. ♂ legs 17, 18 and 19 (telopods) as in Figs 25A-D.

Remarks: This species is unusual among the presumably native North African *Glomeris* in belonging to the "*Eurypleuromeris*" type.

Glomeris punica Attems, 1900

Figs 26-28

Glomeris europaea striata var. *punica* Attems, 1900: 302 (D).
Glomeris connexa var. *punica* – Attems 1908: 105 (F).
Glomeris connexa punica – Brolemann 1921: 100 (L).

Glomeris numidia Verhoeff, 1921: 28 (D), **syn. n.!**
Glomeris numidia – Schubart 1953: 218 (L).
Glomeris punica – Schubart 1953: 218 (L).

Type material: Tunisia, Bou-Kournine (now Bou Kornine), date ?, leg. ?, ♂ lectotype of *G. punica* Attems, 1900 (here designated) (NHMW 3910), paralectotypes: 5 ♂, 1 ♀ (NHMW 3910). The designation of a lectotype (of 60 syntypes, see Attems 1900) seems advisable in order to ensure that the name-bearing type shows the diagnostically important characteristics of the male sex.

Algeria, Gorges de la Chiffa, date ?, leg. H. Ribaut, 2 ♂ syntypes of *Glomeris numidia* Verhoeff, 1921 (♂ "type", ZSM A20070944 + micropreparation A20032086 and ♂ "?type", A20091438). Both ♂♂ represent only part of the type series stated to have consisted of 2 ♂ and 2 ♀ (Verhoeff 1921).

Other material: Algeria, La Chiffa, date ?, leg. Ch. Alluaud (219), 2 ♂, 5 ♀ (MNHN CC 018, collection Brolemann CCXIX). Algeria, le Ruisseau (environs

Figure 26. *Glomeris punica* Attems, 1900, ♂ from Tunisia, Amdoun; **A, B**, habitus, dorsal and lateral views, respectively. (Photographed not to scale by N. Akkari).

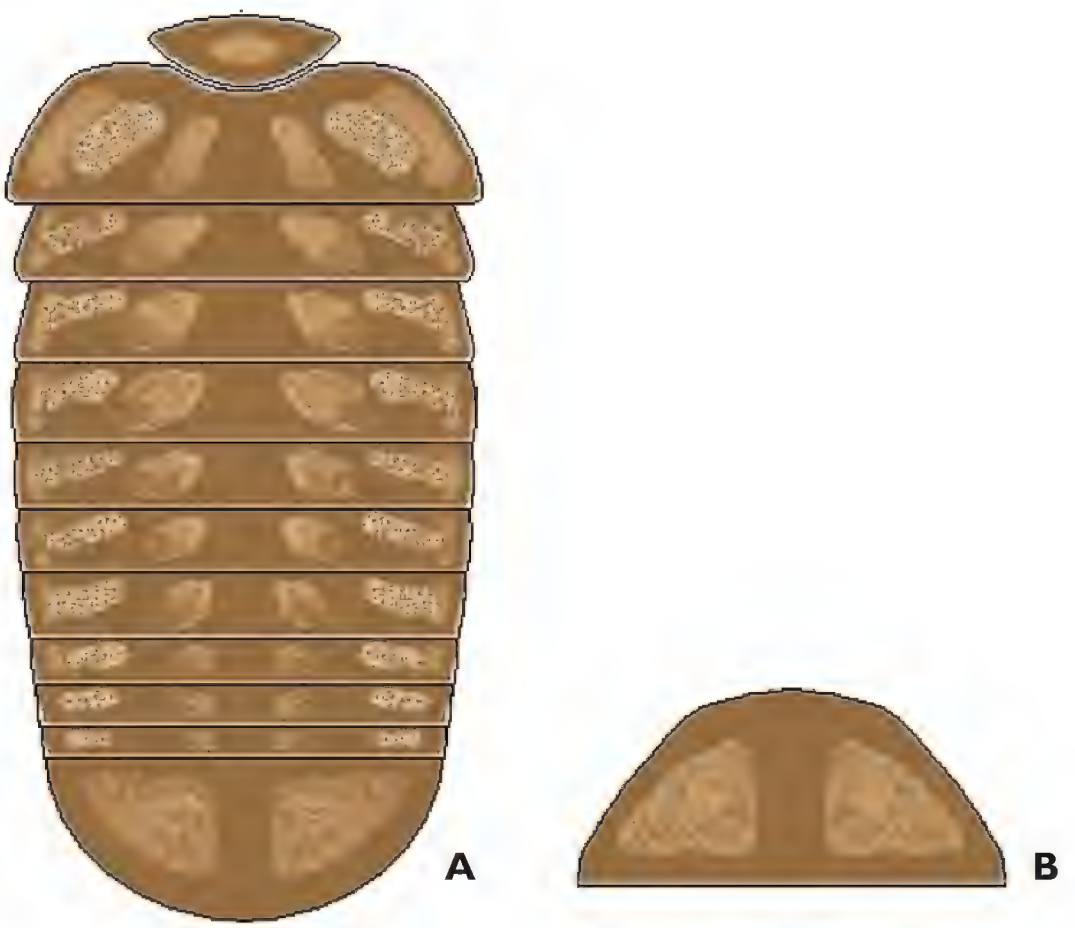

Figure 27. *Glomeris punica* Attems, 1900, ♂ from Tunisia, Amdoun; **A**, habitus, dorsal view; **B**, pygidium, caudal view. A schematic, slightly too vague presentation of the colour pattern (del. J.-P. Mauriès).

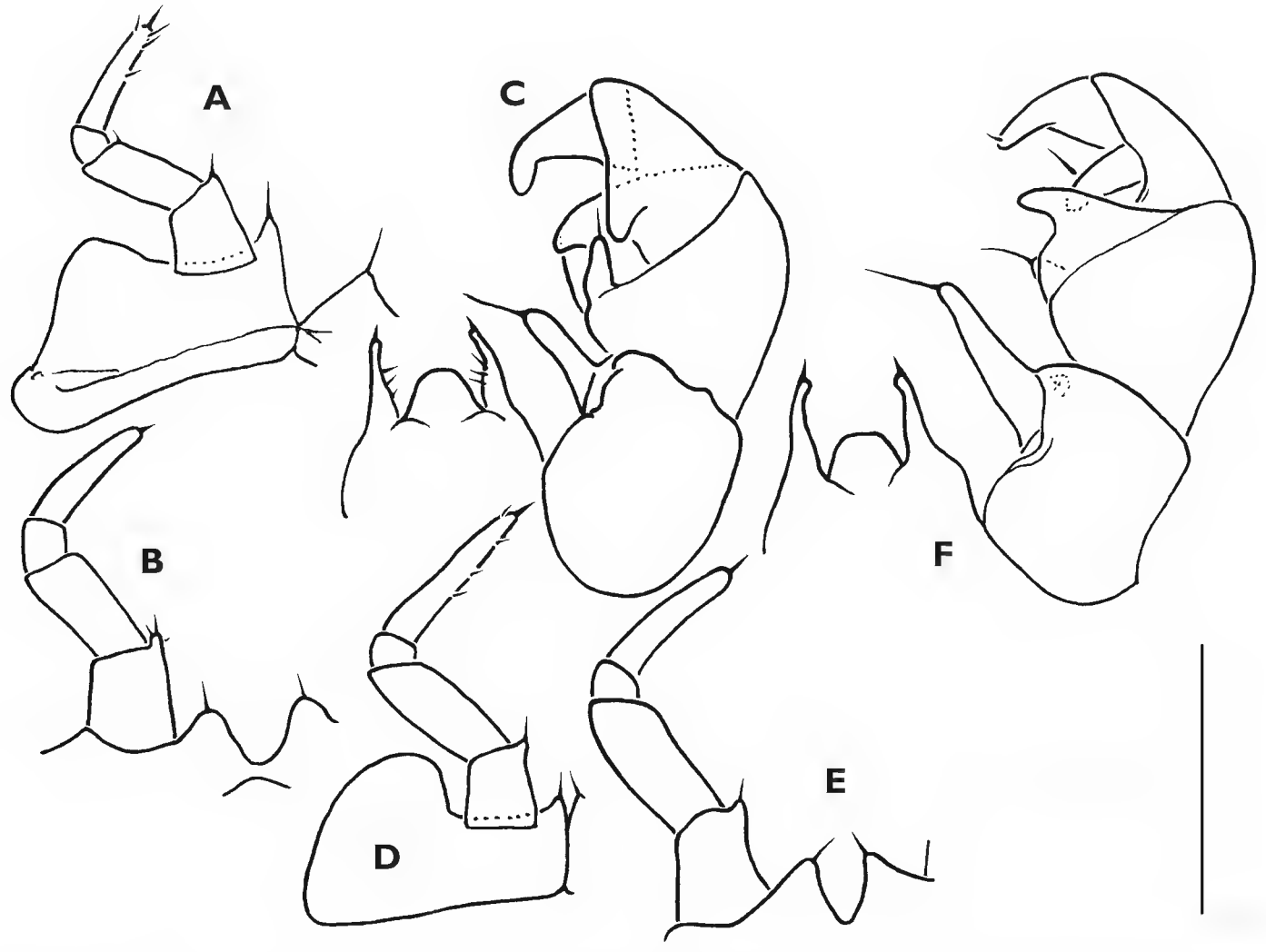

Figure 28. *Glomeris punica* Attems, 1900, ♂ lectotype (A-C) & ♂ from Sakiet Sidi Youssef (D-F); **A, D**, leg 17; **B, E**, leg 18; **C, F**, leg 19 (telopod), frontal and caudal views, respectively. – Scale bar: 0.5 mm.

of Algiers), 18.XII.1892, leg. P. Lesne, 1 ♂ (MNHN CC 018, entry 6-97). Algeria, Yakouren (Kabylia), 10.VI.1893, leg. P. Lesne, 1 ♂ (MNHN CC 018, entry 6-97). Tunisia (Kroumirie), Jendouba Gov., Aïn Draham, V-VI.1906, leg. H. Gadeau de Kerville, 6 ♂, 19 ♀ (MNHN CC 018). Tunisia, Béja Gov., Jebel El Jouza, close to Amdoun Village, under stones, 10.III.2005, leg. N. Akkari, 2 juv. (MNHN CC 018). Same locality, under stones and barks, 25.V.2005, leg. N. Akkari, 2 ♂, 1 ♀ (NMNH). Tunisia, Jendouba Gov., Aïn Draham, Col des Ruines, mixed oak forest with *Quercus faginea* and *Q. suber*, 36°47'N, 8°41'E, under stone, 19.XI.2003, leg. N. Akkari, 1 juv. (MNHN CC 018). Tunisia, Le Kef Gov., Sakiet Sidi Youssef, coniferous forest dominated by *Pinus halepensis*, under stones, 24.X.2003, leg. N. Akkari, 4 ♂, 5 ♀ (ZMUM). Tunisia, Zaghouan Gov., Jebel Zaghouan, alt. 350-390 m, 25.II.2007, leg. N. Akkari, 2 ♂, 2 ♀ (ZMUC 200114). Tunisia, Jendouba Gov., 15 km E of Tabarka, 25.III.1986, leg. Z. M. Cop. Exp., 1 ♂ (ZMUC 200111). Tunisia, Thala Gov., 12 km S of Thala, 10.III.1986, leg. Z. M. Cop. Exp., 1 ♂ (ZMUC 200110). Tunisia, Zaghouan Gov., 3 km SE of Zaghouan, NE side of Djebel Zaghouan, 1.XII.1974, leg. H. Waldén, 1 ♀ (Museum Göteborg). Tunisia, Tunis Gov., Bou Kornine National Park, 18 km SE of Tunis, close to Hammam Lif Town, 36°42'53"N, 10°20'68"E, alt. 105-150 m, *Thuya – Eucalyptus* grove, dry river bed, under stones and logs, 4.III.2008, leg. P. Stoev and N. Akkari, 2 ♂, 9 ♀ (FMNH), 6 ♂, 4 ♀, 1 juv. (NMNH). Tunisia, Zaghouan Gov., Jebel Zaghouan, surroundings of "Temple des Eaux", 36°23'40"N, 10°08'09"E, alt. approx. 300 m, forest close to road, under stones and in leaf litter, 19.III.2008, leg. N. Akkari and P. Stoev, 2 ♂, 4 ♀ (FMNH), 4 ♂, 2 ♀, 1 juv. (NMNH). Tunisia, Jendouba Gov., 15 km of Tabarka, 36°49'97"N, 8°42'34"E, alt. approx. 230 m, *Quercus suber* forest, slope, under stones and barks, 21.III.2008, leg. P. Stoev and N. Akkari, 1 ♂, 2 ♀, 1 ♀ juv. (FMNH), 1 ♀ (NMNH). Tunisia, Béja Gov., 13 km of Nefza (road Tabarka-Nefza), 36°57'61"N, 8°56'51"E, alt. approx. 150 m, *Pinus* forest, under stones, 23.III.2008, leg. P. Stoev and N. Akkari, 2 ♂, 1 ♀ (FMNH). Tunisia, Jendouba Gov., close to Aïn Draham, Fernana, 9.III.2009, leg. N. Akkari and H. Enghoff, 1 ♂ juv., 3 ♀ (ZMUC). Tunisia, Zaghouan Gov., Jebel Zaghouan, 13.III.2009, leg. N. Akkari and H. Enghoff, 4 ♂, 2 ♀, 1 ♂ juv. (ZMUC). Tunisia, Jendouba Gov., 9 km of Hammam Bourguiba (W of Aïn Draham), 36°48'05"N, 8°39'54"E, alt. approx. 380 m, humid *Pinus* forest, close to river, under stones, logs and in litter, 22.III.2008, leg. P. Stoev and N. Akkari, 1 ♂, 1 juv. (NMNH).

Short description: Length up to 12 mm, width up to 6.0 mm. Coloration light to dark brown, terga 2-11 each with 2+2, rather vague, paramedian spots; pattern as in Fig. 27. ♂ legs 17, 18 and 19 (telopods) as in Figs 28A-F. An always high lateral lobe of ♂ coxite 17 is remarkable (Fig. 28A).

Remarks: This species belongs to the "*Stenopleuromeris*" type. Schubart (1963) mistakenly attributed it to the "*Eurypleuromeris*" type.

Discussion

Interestingly, the proportion of *Glomeris* species and populations with a ventrolaterally narrowed tergum 3 increases towards the South. In Central and Eastern Europe, most (if not all) species show a broadly rounded tergum 3, i.e. belonging to the "*Eurypleuromeris*" type, whereas in the Mediterranean area, including North Africa, the majority of species have a shorter anterior part of tergum 3, i.e. they belong to the "*Stenopleuromeris*" type. A ventrolaterally narrower tergum 3 can be seen as an adaptation for tighter body enrolment, possibly providing better protection from desiccation in the South. In North Africa, only *G. mohamedanica* and most (if not all) of the *G. klugii* populations have a somewhat broadened tergum 3, whereas it is considerably narrower in the other species, including even the somewhat intermediate *G. troglokabyliana* sp. n.

Most of the North African species of *Glomeris* demonstrate the same or a very similar structure of the telopod syncoxite, in which the central lobe is rather high to very high, bare and rounded, whereas the coxal horns are crowned with a small bulb/lobule and a setoid filament, the latter either rounded or pointed at its apex. Only two species, *G. klugii* and *G. monostriata* sp. n., show evidently bifid tips of the coxal horns, a character state which may be evidence of closer ties to European rather than North African counterparts. In the case of *G. klugii*, we are rather inclined to admit its early introduction from Europe, naturally from "*conspersa*"-type populations, through human agency to the major sea ports of Algeria and Tunisia. Active trade throughout the Mediterranean has begun at latest with the Phoenicians, ca 3,500 years ago. In the case of *G. monostriata* sp. n., the closest relatives are probably *G. albida* (Spain) and *G. dyonisii* (Sicily), although this might just reflect convergent adaptations to the cave environment.

As elsewhere, there are two striae on the collum in most of the North African *Glomeris* species, reduced to one in *G. monostriata* sp. n. The number of striae on the thoracic shield is more variable, typically ranging from two to four, of which the anterior one or two (rarely none) cross the dorsum.

The distribution of *Glomeris* in North Africa (Figs 29-32) shows that all of the species are, as would be expected, confined to a narrow strip along the Mediterranean coast. The distribution of *G. anisosticta* remains unmapped because we only know it occurs, and is common, in Algeria (Brandt 1840b, 1841a). The proportion of cavernicoles (most likely troglobites) is increased (two of 11 species), which is hardly surprising given the predominantly harsh environments these normally meso- to hygrophilous Diplopoda face in North Africa. Among the ca 100 *Glomeris* species known to date, very few occur obligatorily in caves, i.e. only two from Europe (one in Spain, the other in Sicily) and only another two from North Africa (one in Algeria, the other in Libya).

Much more material is required to properly assess the North African glomeridan fauna. Despite the long history of exploration in Algeria, several taxonomic problems remain, such as the status of *G. anisosticta*. On the other hand, a country like Morocco, which includes most of the Atlas Mountains, will certainly be found to contain more species of *Glomeris*

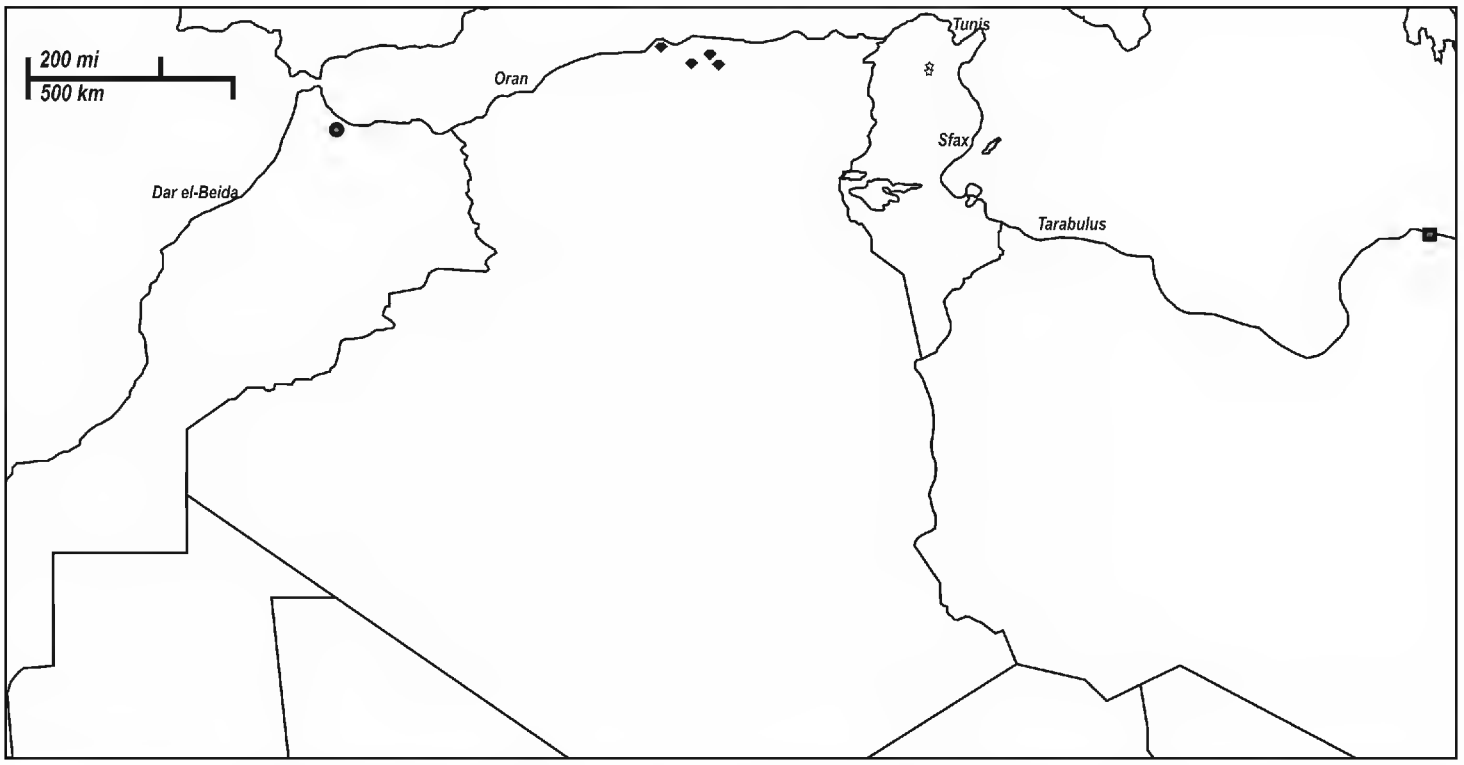

Figure 29. A map showing the distribution of *Glomeris brolemanni* (filled circle), *G. troglokabyliana* (filled diamond), *G. colorata* (open star) and *G. monostriata* (filled square).

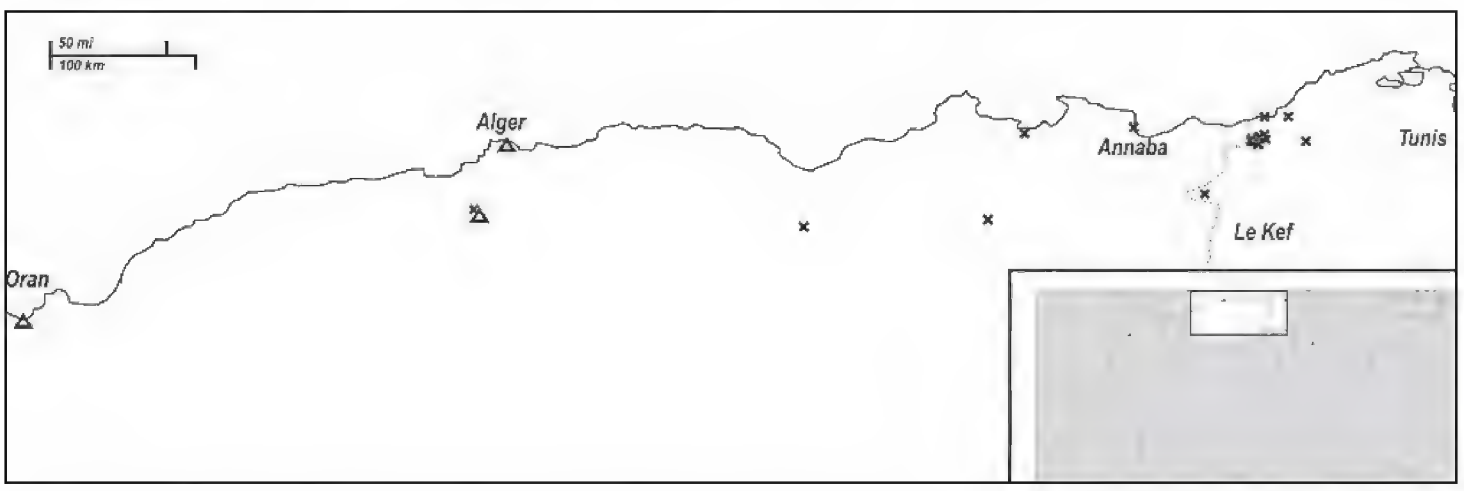

Figure 30. A map showing the distribution of *Glomeris sublimbata* (cross) and *G. flavomaculata* (open triangle).

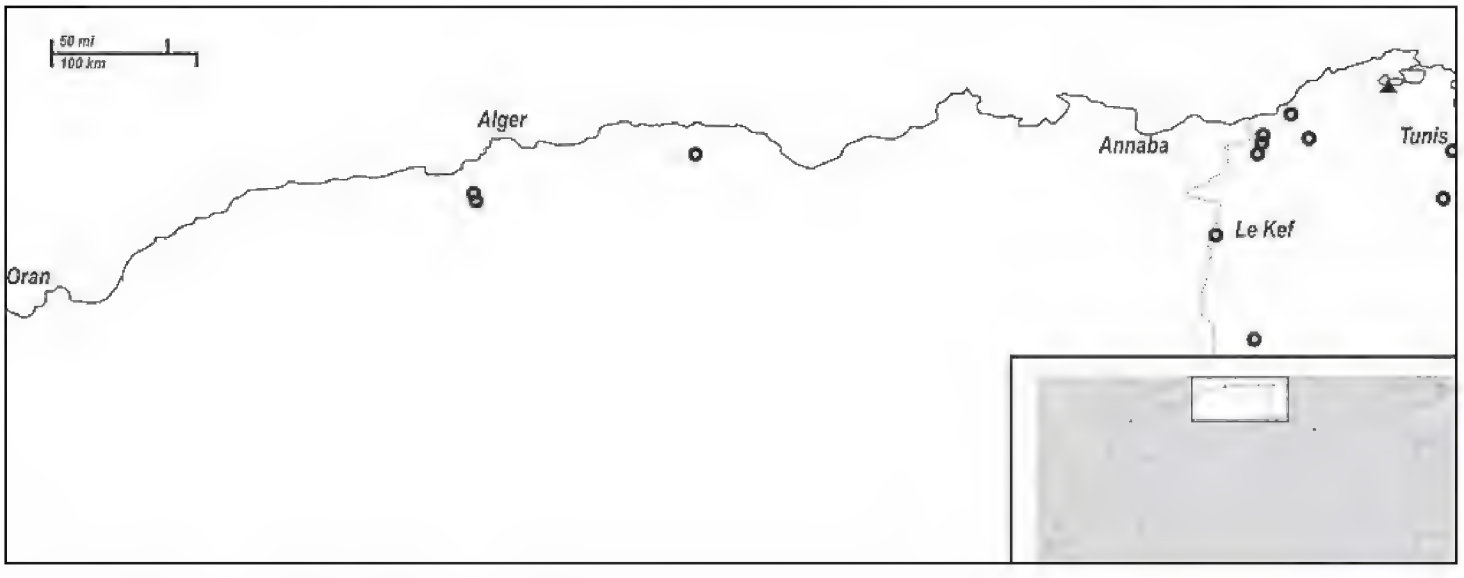

Figure 31. A map showing the distribution of *Glomeris punica* (open circle) and *G. carthaginiensis* (filled triangle).

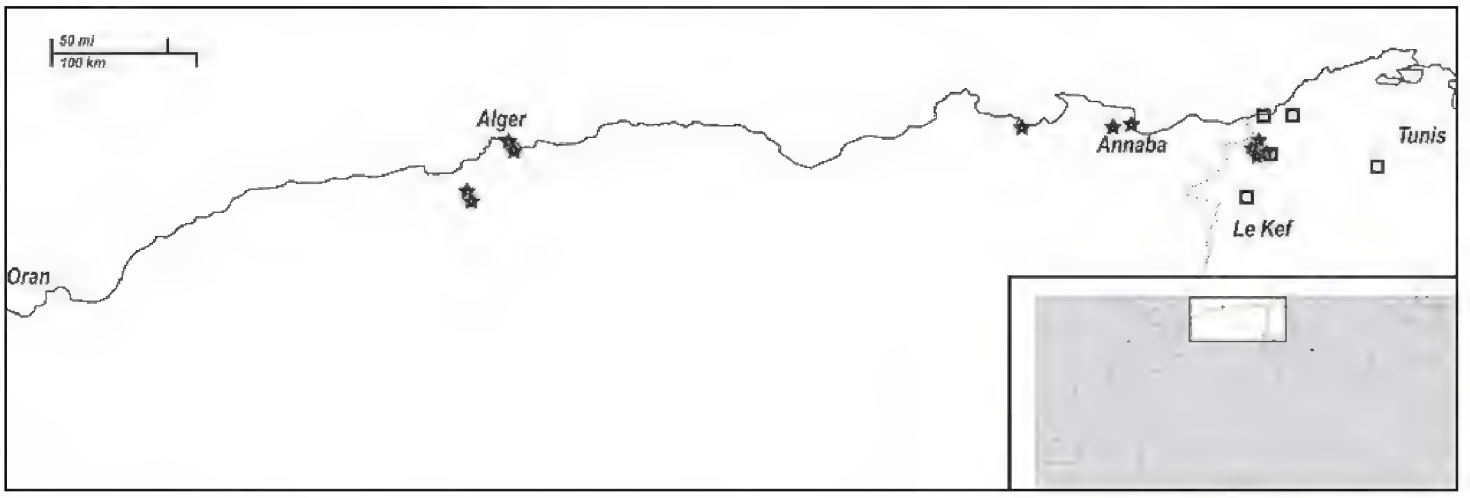

Figure 32. A map showing the distribution of *Glomeris mohamedanica* (open square) and *G. klugii* (filled star).

than just *G. brolemanni*. In addition, the discovery of *G. monostriata* sp. n. in Libya hints that this country might well harbour a richer fauna of *Glomeris*, particularly in caves. Only the relatively small country of Tunisia can claim to be fairly adequately prospected.

Genetic investigations, e.g. allozyme analyses which have been very successfully applied to the study of European *Glomeris* by Hoess and Scholl (1999), might provide further insights into the taxonomy and relationships of the North African species. Scanning electron microscopy can also prove very useful in search for new characters (Golovatch and Enghoff 2003).

An updated checklist of the Glomerida in North Africa is given in Table 2, followed by a key to the species of *Glomeris* occurring in the region.

Table 2. An updated checklist of the Glomerida in North Africa (M: Morocco, A: Algeria, T: Tunisia, L: Libya).

Species	M	A	T	L
Eupeyerimhoffia algerina Brölemann, 1913		+		
Glomerellina convolvens africana Ceuca, 1988			+	
Glomeris anisosticta Brandt, 1841		+		
G. brolemanni Schubart, 1960	+			
G. carthaginiensis Schubart, 1953			+	
G. colorata sp. n.			+	
G. flavomaculata Lucas, 1846		+		
G. klugii Brandt, 1833		+	+	
G. mohamedanica Attems, 1900			+	
G. monostriata sp. n.				+
G. punica Attems, 1900		+	+	
G. sublimbata Lucas, 1846		+	+	
G. troglokabyliana sp. n.		+		

Key to the known *Glomeris* species of North Africa

1 Tegument entirely pallid, rarely only ocelli dark. Cavernicoles **2**
– Head and terga distinctly pigmented, colour pattern evident, coloration mostly vivid. Epigean **3**
2 Collum with a single transverse stria. Syncoxital horns of telopod clearly bifid (Fig. 2D, E). Libya ..... ***G. monostriata* sp. n.**
– Collum with the usual two transverse striae. Syncoxital horns of telopod surmounted with a setoid filament (Fig. 1F). Kabylia, Algeria..... ***G. troglokabyliana* sp. n.**
3 Colour pattern of terga 2-11 without evident, light, paramedian spots, but with alternating light and dark transverse bands (Figs 10, 12, 24) **4**
– Colour pattern of terga 2-(6)11 with 1+1 or 2+2 more or less evident light spots (Figs 3, 4, 7, 15-17, 20-22, 26, 27) **5**
4 Coloration of caudal halves of terga distinctly marbled throughout (Figs 10, 12) ..... ***G. klugii***
– Transverse bands on terga at most only slightly marbled in contact zones (Fig. 24) ..... ***G. mohamedanica***
5 Unusually large yellowish to orange spots on tergum 6, following terga 7-11 uniformly blackish (Figs 20-22) ..... ***G. carthaginiensis***
– Spots on tergum 6 of same size as on adjacent terga **6**
6 Median spots on tergum 2 much smaller than lateral ones ..... ***G. anisosticta***
– Either both pairs of spots on tergum 2 comparable in size or lateral ones (if present) smaller than median ones **7**
7 Coloration uniformly blackish, lighter spots (1+1 or 2+2) very vague, marbled (Figs 15-18) ..... ***G. sublimbata***
– Background coloration brown to blackish, lighter spots more distinct..... **8**
8 Tergum 2 with a single central light spot against a black-brown background. Pygidium uniformly black-brown. Morocco ..... ***G. brolemanni***
– Tergum 2 with 2+2 light spots **9**
9 Background coloration light to dark brown, drab, pattern as in Figs 26, 27 ..... ***G. punica***
– Background coloration dark brown to blackish, pattern vivid **10**
10 Light axial stripe absent (Figs 6-8) ..... ***G. flavomaculata***
– Light axial stripe present (Figs 3, 4) ..... ***G. colorata* sp. n.**

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